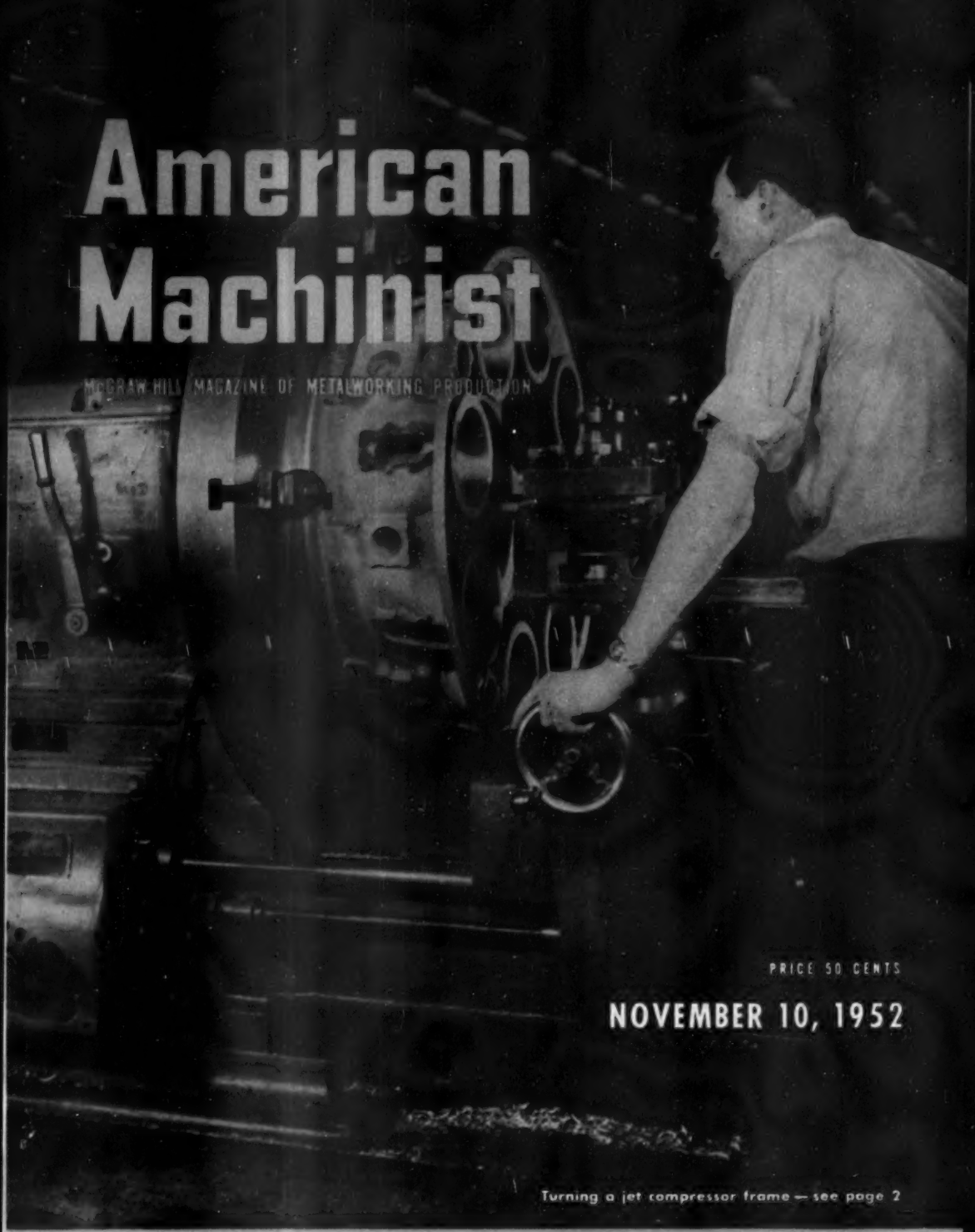
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



PRICE 50 CENTS

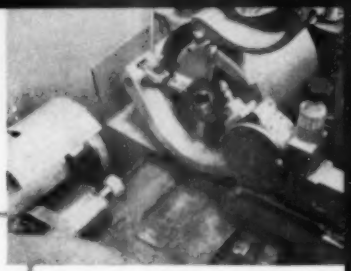
NOVEMBER 10, 1952

Turning a jet compressor frame — see page 2

don't miss: *MID-AIR FORGING p 126*
SAVE DIAMOND BORT p 151 (3 articles)
GRINDING Ti p 135
MAKING THE COSMOTRON p 128

...all in this issue

how to grind a BORE and FACE at the same time



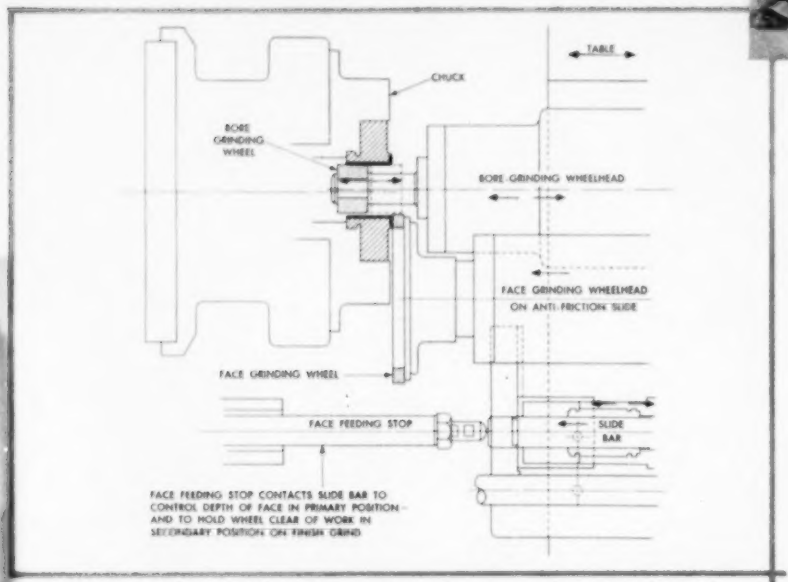


TABLE
CHUCK
BORE GRINDING WHEEL
BORE GRINDING WHEELHEAD
FACE GRINDING WHEELHEAD ON ANTI-FRICTION SLIDE
FACE GRINDING WHEEL
FACE FEEDING STOP
SLIDE BAR
FACE FEEDING STOP CONTACTS SLIDE BAR TO CONTROL DEPTH OF FACE IN PRIMARY POSITION — AND TO HOLD WHEEL CLEAR OF WORK IN SECONDARY POSITION ON FINISH GRIND

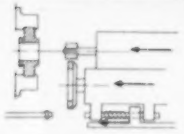
Simplified schematic diagram of grinding wheel arrangement which permits the bore grinding wheel to reciprocate while the face grinding wheel is held forward against the work.

Unique sliding-head design on Heald Model 271 Size-Matic permits grinding both surfaces in the time normally required for bore grinding alone

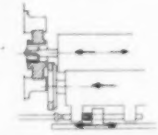
• This setup permits end facing and bore grinding at a single chucking, producing end faces square with bores. What's more, it does *both* jobs without adding to the normal bore grinding time — which means a big saving in total time per part. It is best applied on long production runs.

The facing wheel spindle is mounted on anti-friction slide bars, and is driven by a special motor with an extended stator. As the table reciprocates, the facing wheel is held stationary against the work and the driving rotor remains in the magnetic field of the stator, which moves back and forth with the table. An automatic feeding stop controls the face grinding depth, with provision for wheel face-wear compensation.

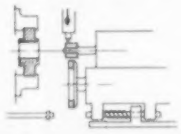
This is another example of how Heald engineering can help to increase your production and improve product quality. Remember — when it comes to precision finishing, it pays to come to Heald.



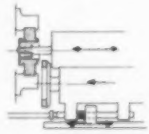
1. LOAD AND START Work is held in a diaphragm chuck and location is by pitch diameter of the gear teeth. Table is then rapid traversed to grinding position.



2. SEMI-FINISH GRIND BORE AND FACE Bore grinding wheel reciprocates with machine table, while facing wheel (mounted on anti-friction slide bars) is held forward against the work under spring pressure, as face feeding stop contacts slide bar to control depth of face grind.



3. DRESS BORE-GRINDING WHEEL Table runs out to dress position for automatic dressing of the bore grinding wheel.



4. FINISH GRIND BORE Dressed wheel reciprocates in bore for finish grind, while facing wheel is held away from work in a secondary position by face feeding stop. In this retracted position, facing wheel may be dressed manually, as required, while the bore is being finish ground.

HEALD

INTERNAL AND ROTARY SURFACE GRINDING MACHINES AND BORE-MATICS

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

Heald precision speeds the nation's production

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

BURNHAM FINNEY ..... Editor
E J TANGERMAN ..... Executive Editor

•

RUPERT LE GRAND ..... Associate Editor
BEN BROSHEER (Chicago) .. Associate Editor
ANDERSON ASHBURN .... Associate Editor
H E LINSLEY ..... Associate Editor
MILES J. ROWAN ..... Associate Editor
GEORGE H DEGROAT .... Associate Editor
WM M STOCKER, JR. ..... Associate Editor

•

NORMAN FABER ..... Assistant Editor
ANN McTAGUE ..... Editorial Assistant

•

RICHARD ROOMAN ..... Art Director
ANNE PALMER ..... Assistant
HELEN LOWE ..... Makeup

•

CHARLES D EMERSON ..... News Editor
STANLEY BRAMS ..... Detroit
WM B WHICHARD ..... Washington
ROBERT E COCHRAN ..... Cleveland
MARGARET RALSTON ..... San Francisco
JAMES LEE ..... Houston
E DALTON WHITE ..... Atlanta
NATHANIEL McKITTERICK ..... London
ROSS HAZELTINE ..... Paris
LIONEL J HOLMES ..... Rio de Janeiro
GERALD W SCHRODER ..... Frankfurt
ALPHEUS JESSUP ..... Tokyo
HERBERT LEOPOLD ..... Manila
JOHN WILHELM ..... Mexico City
JOSEPH GAMBATESE ..... Labor Editor
DOUGLAS GREENWALD ..... Statistician

•

DEXTER KEEZER ..... Director Economics Dept.
GEORGE B BRYANT, JR. ..... Washington
RUSSELL F ANDERSON ..... Editor World News
FRED H COLVIN ..... Editor Emeritus

ABC ABP

ALBERT HAUPTLI ..... Publisher
WILLIAM E KENNEDY ..... Asst. Publisher
HUGH BRITTON ..... Service Manager

•

DISTRICT MANAGERS

R Maultsby ..... Rhodes-Haverty Bldg, Atlanta 3
J H Koch ..... 350 Park Square Bldg, Boston 16
W J Haring ..... McGraw-Hill Bldg, Chicago 11
John Tiebout ..... McGraw-Hill Bldg, Chicago 11
Robert Anderson ..... 1110 Delta Ave, Cincinnati 8
Robert Anderson ..... Hanna Bldg, Cleveland 15
R H Burke ..... Hanna Bldg, Cleveland 15
J Cash ..... First Natl. Bank Bldg, Dallas 1
Philip Weatherby ..... Penobscot Bldg, Detroit 26
H L Kester ..... 1111 Wilshire Blvd, Los Angeles 17
G H Krimsier ..... McGraw-Hill Bldg, New York 36
G Reppert, Jr ..... McGraw-Hill Bldg, New York 36
David Jones ..... Architects' Bldg, Philadelphia 3
R H Burke ..... 719 Oliver Bldg, Pittsburgh 22
John Tiebout ..... Continental Bldg, St. Louis 8
R E Dorland, Jr ..... 68 Post St, San Francisco 4

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

CONTENTS for NOVEMBER 10, 1952

VOL. 96, No. 23

ADMINISTRATION

Editorial ..... *Burnham Finney* 117
Color Blind ..... *Round Table* 165

DIAMOND-BORT CONSERVATION

We Must Conserve Diamond Bort ..... *Anderson Ashburn* 151
Electrolytic Grinding ..... *L H Metzger and George Keeleric* 154
Britain, Too, Has Electro-Spark Machining ..... *M G Seed* 159

SPECIAL REPORT

How to Grind Titanium ..... *Dr Leo Tarasov* 135

FORGING

Cold-Forge Stainless Handles in Mid Air 126

INSPECTION

How Round is Round? ..... *Albert C Sanford* 124
The Collimator and How It is Used ..... *R Fawn Mitchell* 161

MATERIAL CUTTING, FORMING

Great Grandpa Did Contour Turning ..... *A V Reed* 119
Graphite Blocks Trepanned to Save $20 Each ..... *Edward Walker* 122
Machining Stainless Castings ..... *R L Wood & Von Ludwig* 147
Pipe Threads I, II, III (RBS) ..... *Elmer Zook* 177
Equalizing Clamp for Press Work ..... *F C Elmo* 172
Electrode Removes Broken Parts from Deep Holes ..... *A Vetsch* 172
Milling Screw-Slots ..... *Dick Branberg* 172
Only Two Operations to Form Ring ..... *A Vetsch* 172
Simple Modification Speeds Angular Facing ..... *William Gardiner* 173
Rod Collets Punched Blanks ..... *Haim Murro* 173
Welding Thin Plates ..... *R C Vare* 173
Double-Action Die for Pronged Collets ..... *Burnett Menkin* 174

MATERIALS HANDLING

Transfer Carts ..... *E L Brainard* 132
Safety Signal for Hoist Control ..... *Thomas Trail* 174

TOOLING

Cosmotron "Doughnut" Magnet Is 288 Shop-Made Sandwiches 128
Shop Shots 164
Giant Size Plus Accuracy Makes Turbine Building Tough 168
Progressive Radius Milled ..... *Eugene Winkler* 170
Carbide Boring Tool for Deep Holes ..... *Allan Clarke* 171
Don't Neglect Feed Volume for Air Devices ..... *Fred Lettino* 171
Shear for Press Tools ..... *R G Vare* 171
Centering Device Uses Torsion Spring ..... *Haim Murro* 171

NEWS OF METALWORKING

Spot News 103
Washington 105
Detroit 107
Machine Tools 109
Gaging Metalworking 113
Names in the News 192

DEPARTMENTS

Backlash 96
Practical Ideas 170
Reference Book Sheets 177
Talking Shop 183
News of Metalworking 184
Equipment, Materials, Parts 194
Round Table Discussion 226
New Books 263

American Machinist, published bi-weekly with an additional issue in mid-November, by McGraw-Hill Publishing Company, Inc. James H McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, N Y. Curtis W McGraw, President; Willard Chevalier, Executive Vice President; Joseph A Gerardi, Vice President, Treasurer; John J Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B Smith, Vice President and Editorial Director; Nelson Bond, Vice President, Director of Advertising; J E Blackburn Jr, Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to American Machinist Subscription Service, 330 West 42nd Street, New York 36, N Y. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. Position and company connection must be indicated on subscription orders.

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Entered as second-class matter, August 12, 1942, at Post Office, New York, N Y, under the act of March 3, 1879. Printed in U S A.

Copyright 1952 by McGraw-Hill Publishing Co. Inc. All Rights Reserved

NUMBER OF COPIES PRINTED THIS ISSUE 33,832

Chips and Quips

Turbojet Frame . . . Our cover pictures a 28-in./50-in. Nebel "G" Series extension-bed gap lathe in the GE jet-engine plant in Cincinnati turning a large aluminum-alloy compressor rear frame. Feed is 0.010 ipr, speed 170 rpm.

Machining Investment-Cast Stainless . . . Various stainless alloys can be investment-cast; you'd better know the relative machinability *before* casting if you expect to machine 'em. R L Wood and Davidlee Von Ludwig of Arwood Precision Casting Co collaborate to report and interpret machinability data on the materials, from information developed under contract by the University of Michigan. It's a compact four pages.

Grandpa's Turning . . . Our current lead article is intended to be both nostalgic and startling. It describes a type of lathe made 150 years ago, yet able to perform the most intricate contouring and profiling operations. What's more, it's still in operation. A V Reed and Norman Tweddle did the story.

Grinding Ti . . . At the last minute, we tore up this issue and changed Special Reports. The new one is 12 pages of just-released data on grinding titanium, as worked out by Dr Leo Tarasov of Norton Co. We also added a new idea in forging presses—the monolithic throatless press—here announced for the first time. Like the Impacter, "it is a new idea under the sun."

How Round? . . . A C Sanford of Federal Products brings up the matter of measuring rounds, points out that 2-point measurement isn't the answer—particularly if the circumference is lobed, because 2-point measurement won't show it. Here is an easy-to-understand discussion of checking to detect out-of-roundness.

Transfer Carts . . . Reliance Electric never puts the variable-speed drive cabinets it makes on the floor, either for assembly or test. Major components are assembled on a roller section, slid onto a roller-section transfer cart that runs on rails to the wiring station. The same procedure is followed at wiring, testing, painting, and boxing. Handling time is reduced, conveyors provide process storage, and nothing gets lost or mislaid. E L Brainard tells the story of the little carts.

Tooling . . . In addition to items elsewhere described, we have two spreads on tooling, one showing large setups in machining hydro-turbine parts at Baldwin, the other a general group of Shop Shots.

Impacter . . . For a civilization that's supposed to have exhausted new ideas some years back, ours is certainly hopping. Here's another radical new one—this time affecting impact forging. We describe an installation that puts handles on knives—first use of a new unit also announced in this issue. . . . An idea that has been around longer, but is only now finding real application, is trepanning. Edward Walker, tool engineer for Allis-Chalmers, describes some carbide-tipped tools that permit two parts to be machined from one graphite blank.

Coming . . . Nov 24 *AM* will include a Special Report on machinability data applied at Curtiss-Wright—and a walloping one-third reduction in machining costs. There'll also be pix of unusual tooling at Packard for producing Navy diesels, other articles on welding stainless tanks, on form-block grinding, on subzero work, on safety at Chain-Belt, and on diamond-pin locators.

The issue you'll probably see before that, however, if binding and mailing can be done in time, is our 75th Anniversary Number, scheduled for Mid-November. This is one you'll want to keep and study at your leisure.

OPTICS AT WORK . . . R Fawn Mitchell put himself through college mostly by taking pictures, so it was logical that he should join Bell & Howell when they were just starting to introduce 16-mm movies for amateur use. For 12½ years there, he was in charge of the Technical Division, making many improvements in equipment and technique. He also specialized more and more on optical problems. This led him, during World War II, to set up two companies for quantity production of optical parts and testing equipment, while he made a 2-year study of all types of precision-measuring instruments. From this came several patents and new tools, one the angle-measuring collimator, the use of which is described in this issue. He has written seven scientific papers and a number of articles.

ONE CUT
FROM THE SOLID
16 D. P. and Finer

- Gleason No. 2 Straight Bevel Generator
- Complete Precision Gears in one Operation
- Features Interlocking Multi-blade CONIFLEX® Cutters
- Easily Set-up for Job Lot Quantities
- Can Be Equipped with Automatic Loader
- Cuts CONIFLEX® Gears . . . Localized Tooth Bearing

GLEASON

GLEASON WORKS

BUILDERS OF BEVEL GEAR MACHINERY FOR OVER 85 YEARS

1000 UNIVERSITY AVE. · ROCHESTER 3, NEW YORK

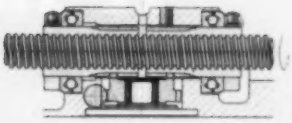
Stabilizer Excitable

Wide cuts are no longer a nerve jarring operation with Dynapoise Overarm on the job.

PLAIN MACHINE
No. 2ML—3hp
No. 2MI—5hp

CIN

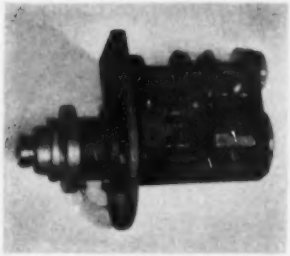
CINCINNATI



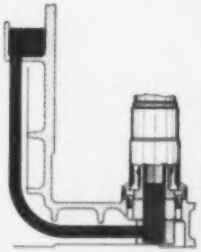
Down-milling, too, with Automatic Backlash Eliminator.

Easy, quick spindle speed selection. A single lever does the job.

for Setups



Maintenance simplified with unit construction of speed and feed drive gears.



Automatic lubrication through individual system, keeps vertical screw cool.

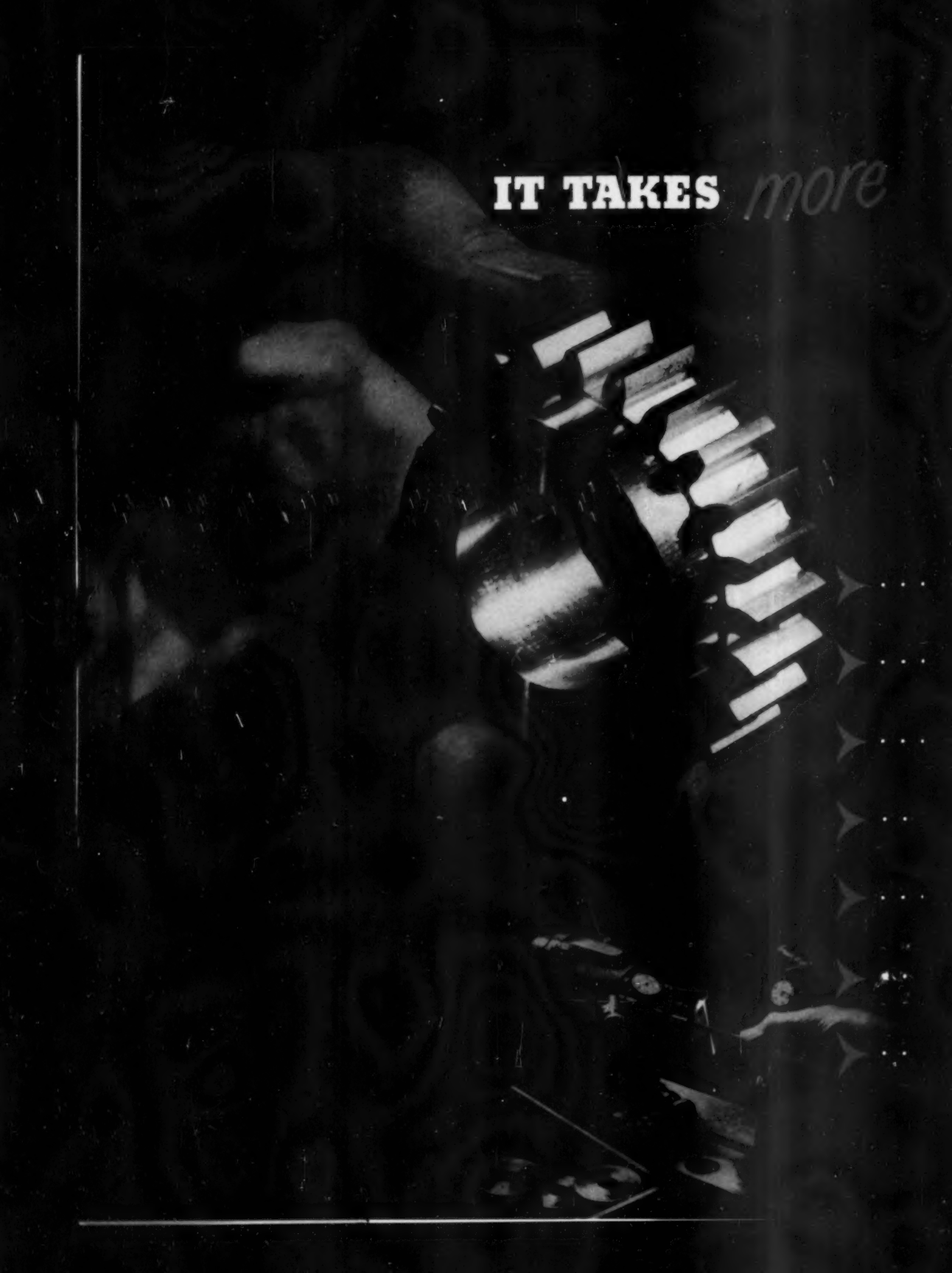
UNIVERSAL MACHINE
No. 2MI—3hp
No. 2MI—5hp

Some types of milling setups have a tendency to squeal like a pig. The Dynapoise Overarm, an exclusive Cincinnati feature, takes out the squeal, allowing higher speeds and feeds to be used. And absence of chatter is easier on the operator's nervous system, too. ¶ This is just one of the many advantages offered by CINCINNATI Nos. 2ML and 2MI Milling Machines. Others include quick, easy selection of spindle speeds. One-half turn of a single crank, right or left, does the job. A similar arrangement at the front of the knee is provided to select feeds. The vertical screw is automatically lubricated in a bath of oil from an individual reservoir. To simplify maintenance, spindle speed drive gears and feed drive gears may be removed as separate units. An *automatic* backlash eliminator device for the table feed screw can be built into the saddle, if desired. It adds "climb" milling operations to the variety of work assignable to the 2MI. Add all these advantages together and you'll come up with only one answer . . . CINCINNATI *is the best buy.* ¶ CINCINNATI Nos. 2ML and 2MI Milling Machines are built in plain and universal styles, and the No. 2MI in vertical style. Complete data may be obtained by writing for catalog No. M-1662-2.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINNATI

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID


IT TAKES more

THAN A GOOD MACHINE

TO CUT A GOOD GEAR

it takes:

- . . . . **The determination to produce a quality product**
- . . . . **The establishment of adequate metallurgical "specs"**
- . . . . **Blanks to have precision-machined bores and faces**
- . . . . **Blanks to be held true with bore**
- . . . . **Real care given to set-up in mounting blank**
- . . . . **Fixtures to have precision locating-faces**
- . . . . **Studied balance between roughing and finishing cuts**

As every gear man knows, the control inherent in the Fellows Method can turn out gearing of super accuracy.

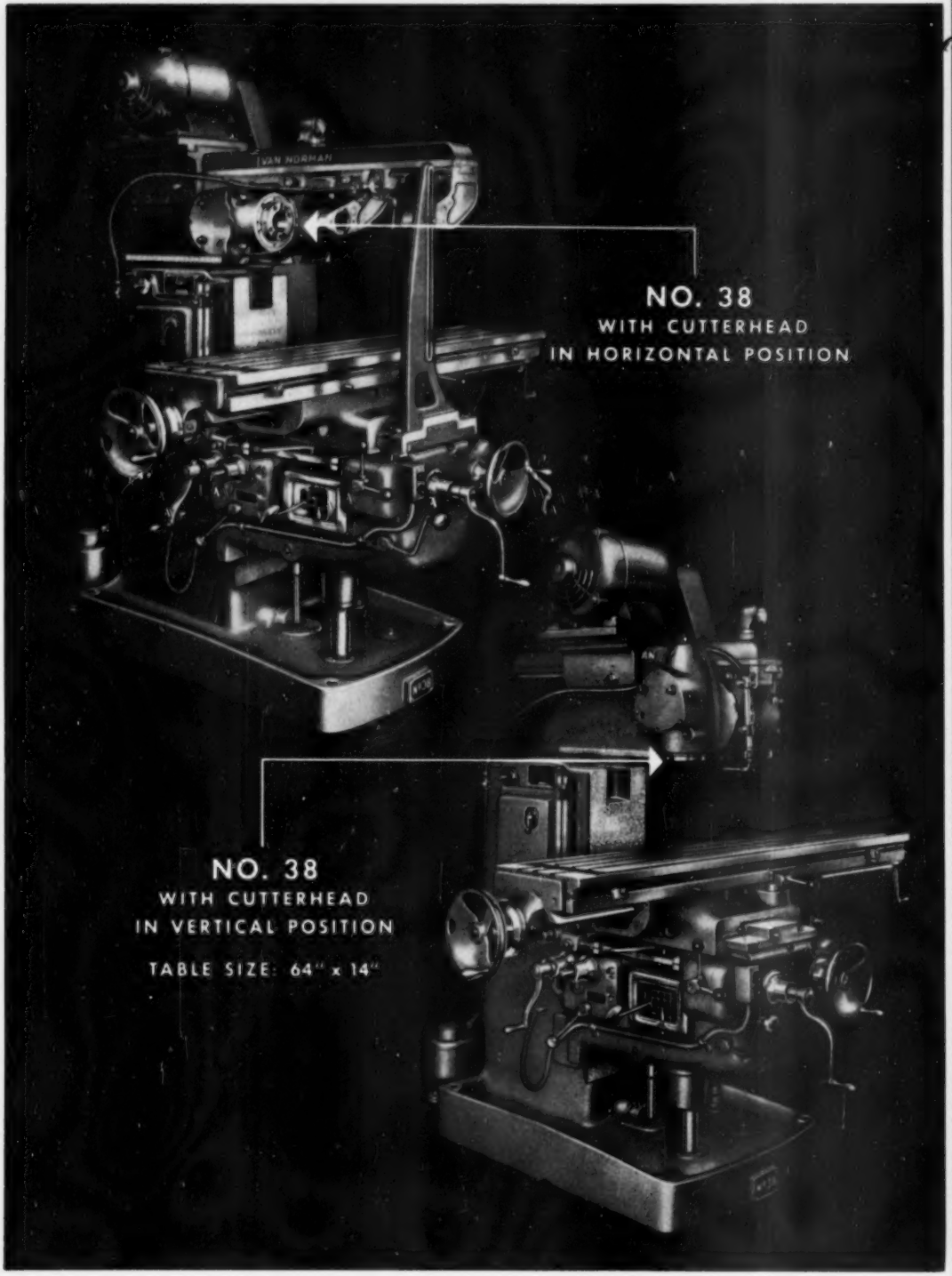
But—since accuracy in gearing is directly related to all preceding operations, it is necessary to plan ahead of the actual cutting if any machine is to do its super-accurate work.

Blanks, for example, must be accurately machined... mounting must be executed with utmost care... roughing and finishing speeds and feeds must be wisely proportioned. Then, the Gear Shaper, tooled with Original Fellows Cutters is unmistakably the experts' finest precision tool.

Of the same high order is Fellows Field Engineering Service. So, for high-accuracy gears, start by discussing your over-all plans with an engineer from the Fellows Office nearest you.

Fellows

THE FELLOWS GEAR SHAPER COMPANY
Head Office and Export Dept., 78 River Street, Springfield, Vt.
Branch Offices: 323 Fisher Bldg., Detroit 2; 5835 West North Avenue, Chicago 39; 2206 Empire State Bldg., New York 1


VAN NORMAN
NO. 38
WITH CUTTERHEAD
IN HORIZONTAL POSITION
NO. 38
WITH CUTTERHEAD
IN VERTICAL POSITION
TABLE SIZE: 64" x 14"

VAN NORMAN

Ram Type Millers Give You

MORE USEFUL WORKABILITY per Machine

The advantage of Van Norman Ram Type Millers is their versatility to meet the daily milling requirements by enabling operators to perform horizontal, angular or vertical milling, using conventional milling practice and standard arbors and cutters, all with one machine.

Not only does this important feature give you the workability of several single machines, but it also minimizes work set-ups . . . cuts idle machine and operator time by permitting you to meet job to job milling requirements as they occur.

In addition, the movable ram in combination with the saddle cross feed increases the work range and capacity of work that can be handled.

Because Van Norman Ram Type Millers enable you to meet all milling jobs, they keep operators and machines working. They cut costs, improve accuracy and increase production.

Write for information and catalog describing Van Norman Ram Type Millers.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

LANDIS "AUTOMATIC" ... POINTS

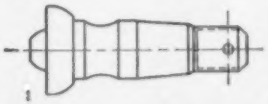
LANDIS *Machine* COMPANY

LANDIS TRADE MARK

PROVED BY PRODUCTION

AND THREADS 1020 BALL STUDS PER HOUR

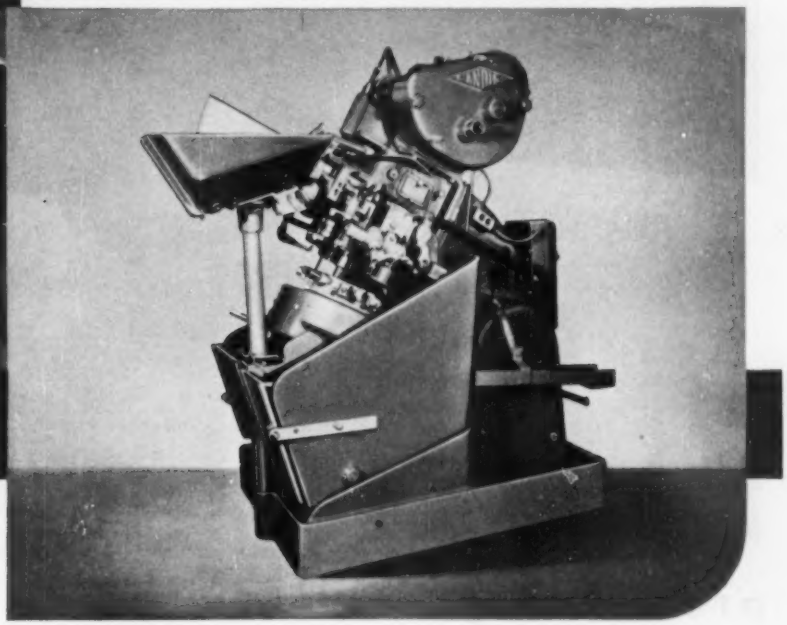
Through the use of LANDIS Automatic Forming and Threading Machines, a large manufacturer has solved his problem of mass-producing certain automotive parts.



The workpieces are cold-forged ball stud blanks. Specifications require a 45° point and a 9/16" 18-pitch NF thread cut to a length of ⅝". In constant daily operation is a battery of LANDIS Automatic Forming and Threading Machines, each of which point and thread 1020 pieces per hour. Four hours of production are obtained between chaser grindings, resulting in low tool cost and minimum machine down time.

Because of their universal features, LANDIS Automatic Forming and Threading Machines are adaptable to mass-production operations on a wide range of automotive parts. By means of pick-off speed change gears, the machine cycle can be varied to accommodate any combination of thread length, pitch, and thread diameter, within the capacity of the machine—therefore this machine is adaptable to a wide variety of work. Hopper feed and automatic operation throughout enable one operator to keep a battery of machines in constant production, while set-up changes of all types can be made in minimum time.

Can you revolutionize your pointing and threading operations with LANDIS Automatic Forming and Threading Machines? Please give specifications when writing for complete information.



WAYNESBORO PENNSYLVANIA

Quick Change of Set-Up Makes

...features of

Landis 10" x 24" Type CH Universal Grinder

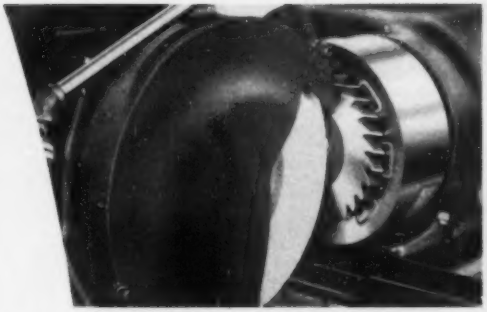
Modern operating features of Landis Universal Grinders permit quick set-ups. This gives flexibility and economy of operation for small lot manufacturing, toolroom and maintenance work. Write for Catalogs. Landis Tool Company, Waynesboro, Pennsylvania.

LANDIS

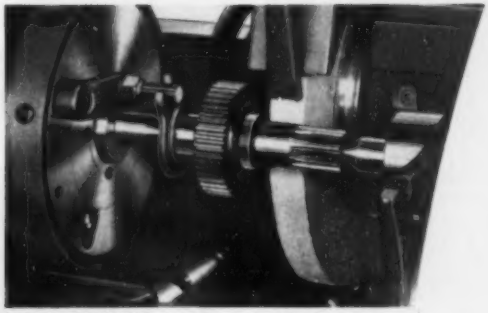
precision grinders

Small Lot Grinding Profitable

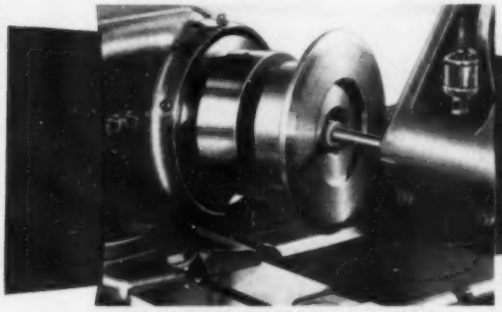
Landis Universals cut costs on precision grinding operations



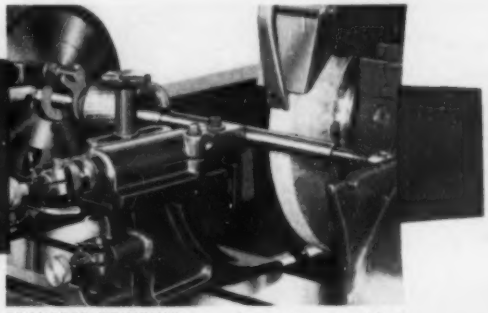
FACE GRINDING—magnetic chuck and low, compact swivelling headstock. Operator can make fast selection of correct speed.



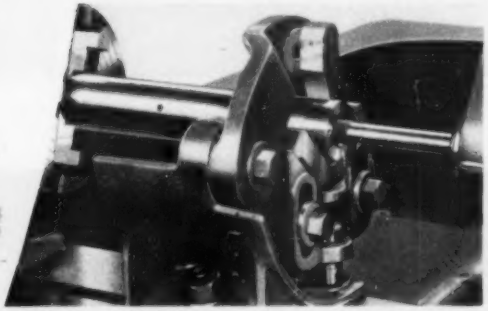
INFEED GRINDING—precision wheel feed and Microsphere wheel spindle bearings give accurate results and fast sparkout.



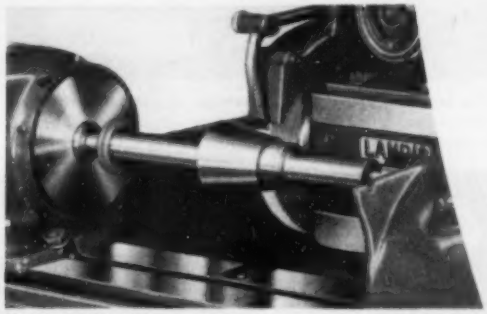
INTERNAL TAPER GRINDING—modern swing-type fixture provides quick changeover from external to internal grinding operations.



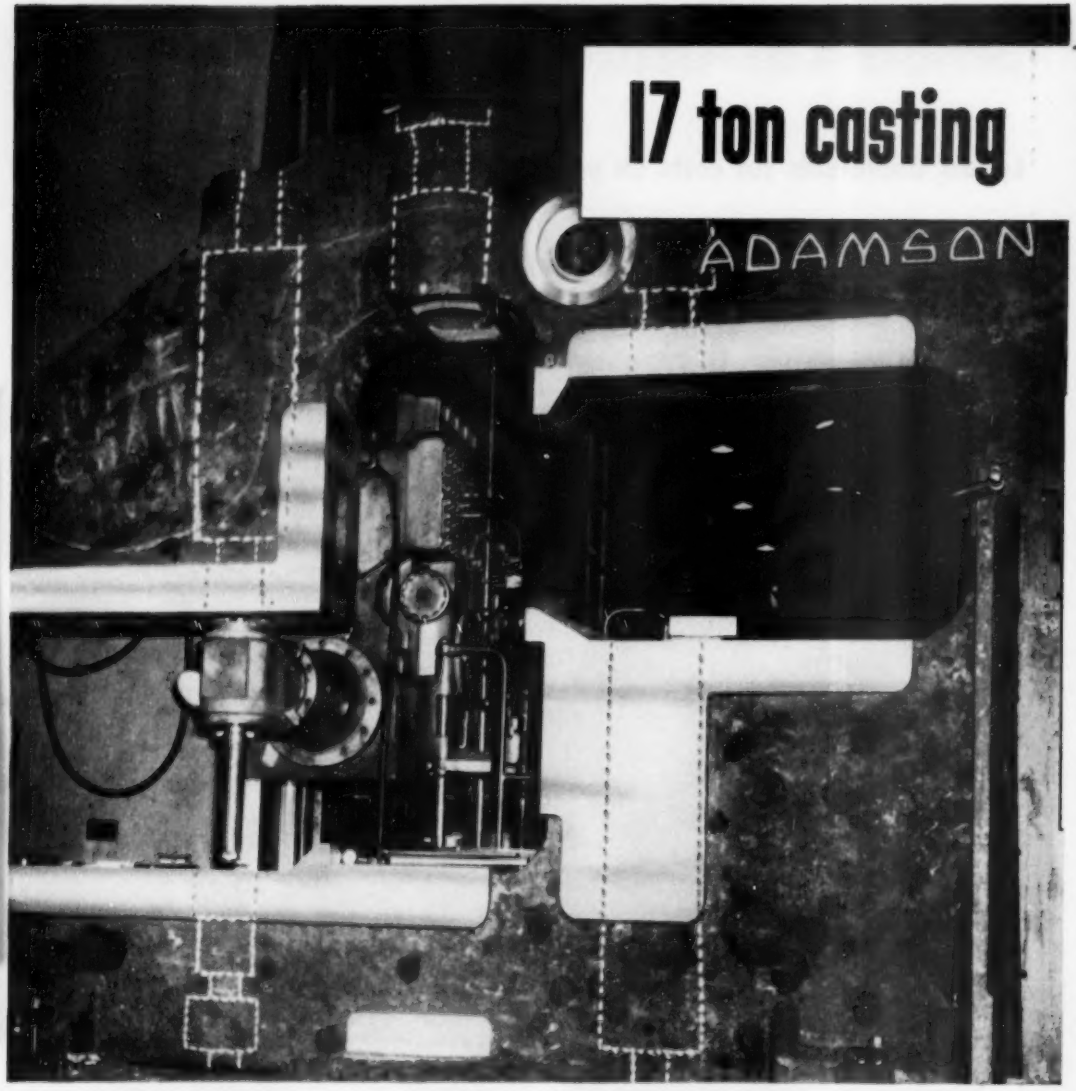
TRAVERSE GRINDING—use of automatic wheel feed saves time on short run traverse grinding jobs.



INTERNAL GRINDING—deep hole inside long work piece held in chuck and center rest. Wide variety of quills and wheels available.



TAPER GRINDING—tapers are easily ground. Piece shown has taper of 14° included angle. Wheelbase and headstock also swivel.



ONLY ONE SETUP WAS NEEDED TO PERFORM ALL THESE OPERATIONS — Simple tooling and G&L accessories made a single setup sufficient for these three operations:

(A) machining and facing windows
(B) boring bearing holes (shown by dotted lines on casting)
(C) cutting large keyways

GIDDINGS & LEWIS

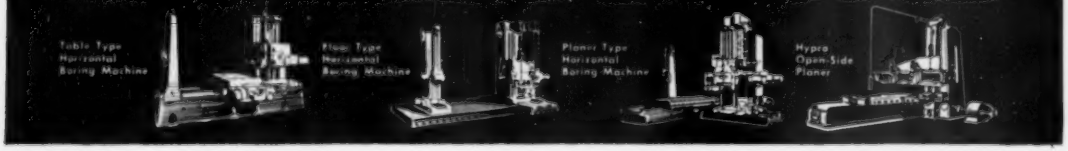
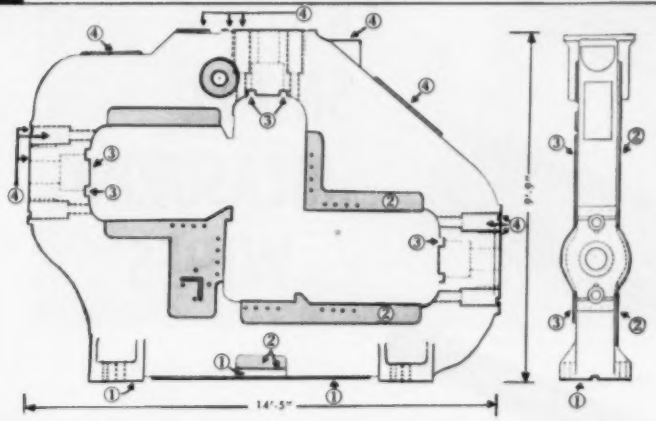


Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hypro Open-Side Planer

completely machined in 4 setups

All operations neccessary to complete job — milling — boring — drilling — tapping — done on G&L 570-T (7-inch bar) table-type horizontal



SETUP 1 — the work was laid flat, the bottom seat and keyway were machined and the job was generally laid out to be true for centerlines, etc.

SETUP 2 — the piece was raised and set on the bottom foot and the back surfaces were machined off.

SETUP 3 — the piece was turned around. The previously machined surfaces were then used for locating against machined angle plates and the operations described in the photo caption were completed.

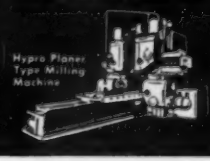
SETUP 4 — next the work was laid down on the flat machine surfaces. And the end and top were machined respectively. All drilling and tapping operations were performed on the same machine.

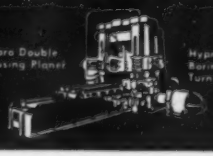
ADAMSON-UNITED CO. of Akron, Ohio, use a G&L 570-T to solve the problem of machining huge castings with increased speed and accuracy. This highly versatile machine performs all boring, drilling, and tapping operations necessary to complete the illustrated 34,500 lb. calendar housing. And, in addition, through use of inexpensive, interchangeable tooling such as the angular milling head and an extended boring bar (shown in photo), the number of setups necessary have been greatly reduced.

Details of this complete job are shown in the accompanying photo and in the drawing above. The numbers indicate in chronological sequence the order in which operations were performed.

Like Adamson-United, you'll find there is a G&L machine to solve your particular problems. See your G&L dealer or write direct for complete details on G&L's unbiased Job Analysis Service. But don't delay . . . because DELIVERY ON G&L MACHINES MAY BE BETTER THAN YOU THINK.

MACHINE TOOL CO.


Hypro Planer Type Milling Machine


Hypro Double Housing Planer

Hypro Vertical Boring and Turning Mill

G&L

FOND DU LAC WISCONSIN

Van Keuren

LARGE AND SMALL MEASURING WIRES

BIG ONES LITTLE ONES ANY SIZE AT ALL

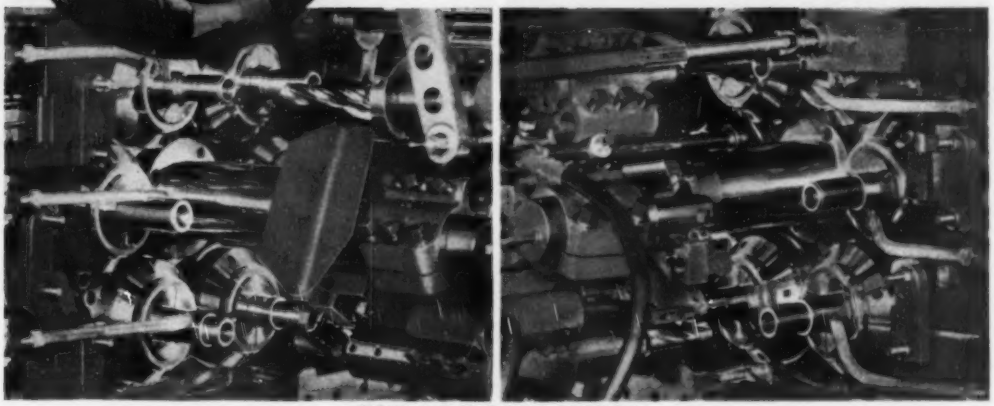
PERFECT cylinders for all measuring purposes,—Threads, Gears, splines, dovetails and angles.

Complete specifications on Van Keuren Measuring Wires, and formulas for their use are given in the Van Keuren 1952 Catalog and Handbook No. 35.

Write for your copy

THE Van Keuren CO.,
173 WALTHAM STREET, WATERTOWN, MASS.
33rd YEAR
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

NO NEED TO "SETTLE" FOR LESS



FRONT AND REAR SIDES OF 2⅝-SIX

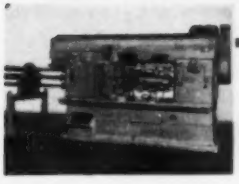
Multiple Spindle Bar Automatics produce more work per square foot of floor space than do other types of metal cutting machine tools. But, when *one* spindle is "down" *all* are "down." It's why dependability will always be the outstanding requirement of the "Automatic."

So many factors are involved in dependability that any weakness in design, engineering, material, or construction, will eventually contribute to higher costs of operation and maintenance.

Part of any new machine's service to the prospective user is the availability of *full* information. No prospective purchaser need "settle" for less. At least it's that way with CONOMATICS.

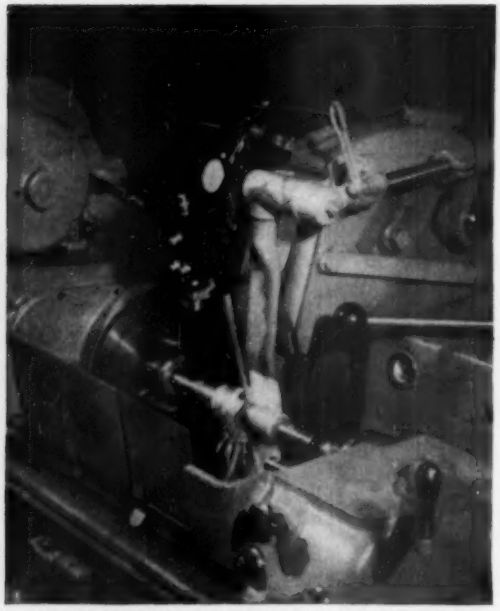
In producing the piece shown, on a 2⅝-SIX, the eccentric forming attachment (see upper right illustration) combines the well known CONOMATIC facilities of form tool support and "all position" attachment spindle drive.

A Comparison of ALL Automatics is in favor of Cone



Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

SURFACE GRINDING. For fast, cool cutting action Norton wheels, cylinders and segments are unbeatable. 32 or 38 ALUNDUM abrasive for hardened steels and CRYSTOLON abrasive for gray iron and non-ferrous metals.



O.D. GRINDING. Norton O.D. wheels in the abrasives, grain sizes and bonds for best results on every material are sure protection for big grinding machine investments.

NORTON BRINGS YOU

More types of abrasive products...

for More savings...on More jobs

You'll find the right answers to every one of your grinding problems in the Norton line of abrasive products. First, because it is the world's most complete line — offering you more choices than any other. Second, because Norton Research — which has chalked up an impressive list of "firsts" in abrasive development and Norton's endless field testing — make sure that every Norton abrasive product will deliver top performance on the work it is designed for.

That's the combination of variety and efficiency that will cut time, labor and costs on every grinding job you do.

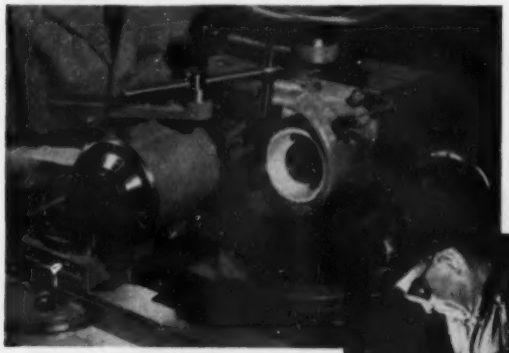
SEE YOUR NORTON DISTRIBUTOR for practical help in any grinding application. He knows Norton products — what they will do and what they won't do — and you'll find that his aid in selecting the right ones for *your* jobs is a real short cut to better, lower cost grinding . . . NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products to make other products better

TOOL AND CUTTER GRINDING. Norton New-Process wheels have no equal for uniformity, identical wheel performance and long even wheel wear. 32 ALUNDUM* abrasive for carbon and alloy steel, CRYSTOLON* abrasive for cemented carbides.



MOUNTED WHEELS AND POINTS. Hundreds of sizes and shapes for smooth-as-silk cutting action, with no bounce or vibration. Each one is trued on its own spindle to eliminate "breaking in" and to insure its running absolutely true.

POLISHING AND LAPPING. ALUNDUM grain comes in surface treatments and grain sizes for best results on every polishing job. And precise sizing makes ALUNDUM and CRYSTOLON abrasives favorites for even the fussiest lapping jobs.

ROUGH GRINDING. On swing frames, floor stands or portable grinders, Norton wheels "hug that work," to cut time and costs. And Norton *Reinforced Hub* Wheels are the safest, most versatile ever made.

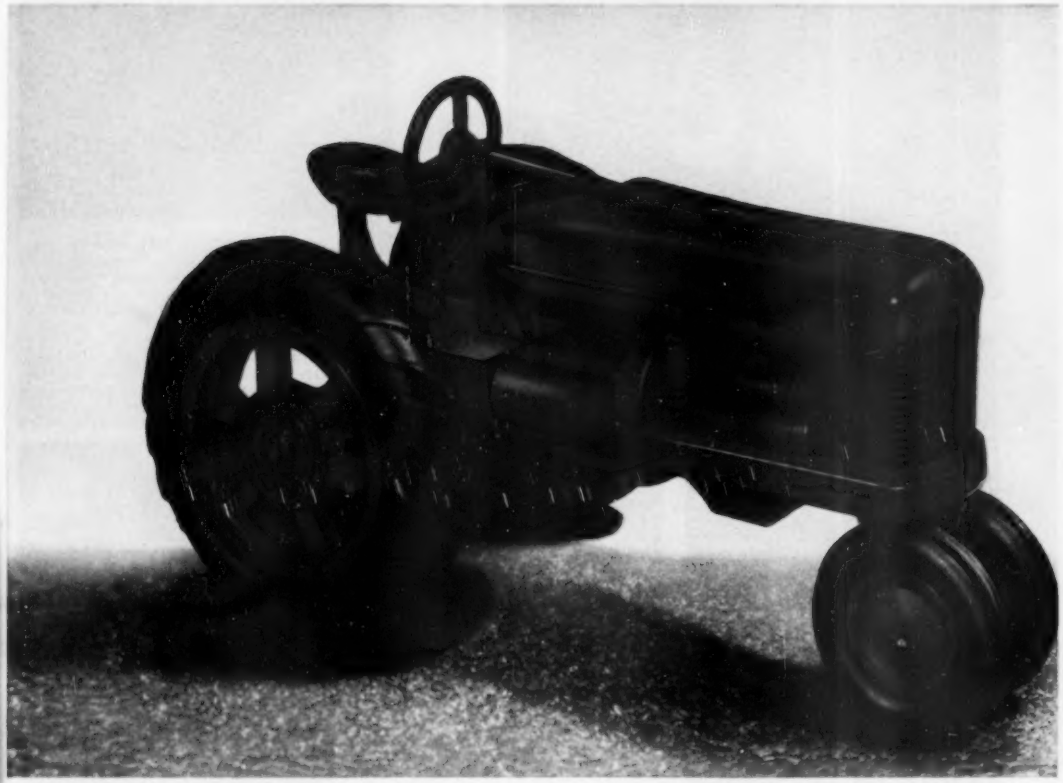
BARREL-FINISHING. ALUNDUM tumbling abrasive, being *all* aluminum oxide, cuts without glazing, and has the hardness and toughness to stand repeated use. It's the abrasive for real precision-finishing.

DISC GRINDING. Norton ALUNDUM and CRYSTOLON discs boost production and reduce down-time. They leave flat surfaces straight and smooth, with no excess heat to cause warpage.

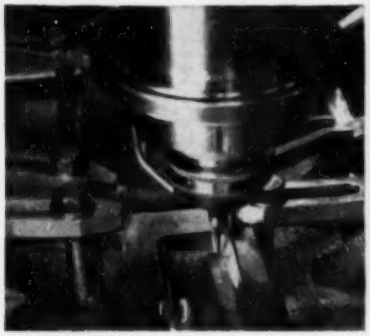
INTERNAL GRINDING. Being identical in grinding action, Norton *New-Process* wheels can be changed without machine adjustments. That and uniform top performance make them valuable production boosters.

CUTTING-OFF. For wet or dry applications, high or low speeds, on any material, there's a Norton wheel in ALUNDUM or CRYSTOLON abrasive that's "made to order" for fast, economical cutting off.

STORY OF A TOOL,

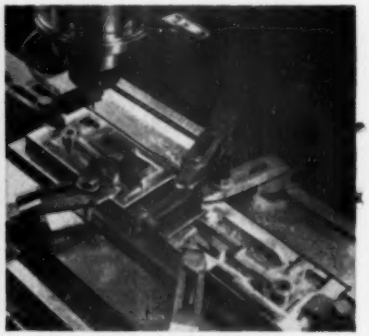


Look at that model! — so real you can almost hear the motor roar! Scale: 1/16" to 1". Accurate molds like the one that made this tractor are ideal jobs for Kearney & Trecker-Milwaukee Rotary Head Milling Machines.



Here's a close-up of one of the form cutters and one of the female halves of the mold. Note smooth finish.

Set-up for milling two halves of mold not changed until job is done. This insures faster and more accurate results.



Another set-up for milling mold halves. Note the gleaming final finish — very little or no hand finishing required.

A TOY AND A MOLD

Illustrated example of how the Rotary Head Method of Milling can solve highly complex milling problems . . .

SEE that scale model of a famous farm tractor — notice the fineness of detail!

Would you believe that one machine was capable of reproducing those details in the mold — that no models or templates were used — that all the machine operator needed was a set of blueprints?

Yes, that is exactly the case. The Kearney & Trecker-Milwaukee Model 2D Rotary Head Milling Machine has this amazing versatility.

It can reproduce geometric shapes in both horizontal and vertical planes! All the operator has to do is be able to read a blueprint and work simple mathematics!

On the job, the operator worked from scale reductions of real tractor assembly prints—only the most minute details eliminated. Workpiece material was oil-hardening tool steel. Results? The Rotary Head Milling Machine was Fast, Direct, Accurate.

Fast, because there was no delay in getting the job underway — no extra operations.

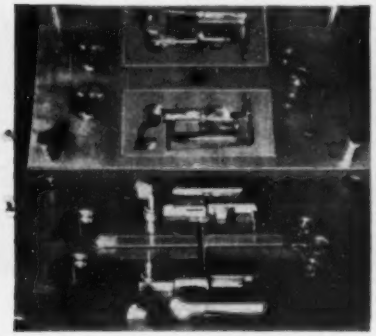
Direct, because the blueprint dimensions were transmitted immediately into metal.

Accurate, because the precise control of all cutting operations is built right into the machine.

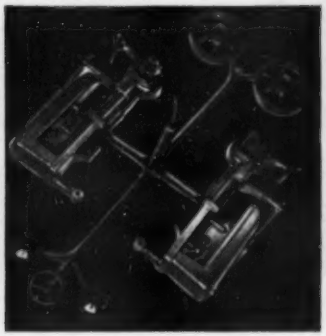
If you have an unusual production problem—it will pay you to investigate the Model 2D Rotary Head Milling Machine — For complete data write for Bulletin D20 — Kearney & Trecker Corporation, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

Photos and data courtesy of: Product Miniature Co., Inc., Milwaukee, Wisconsin



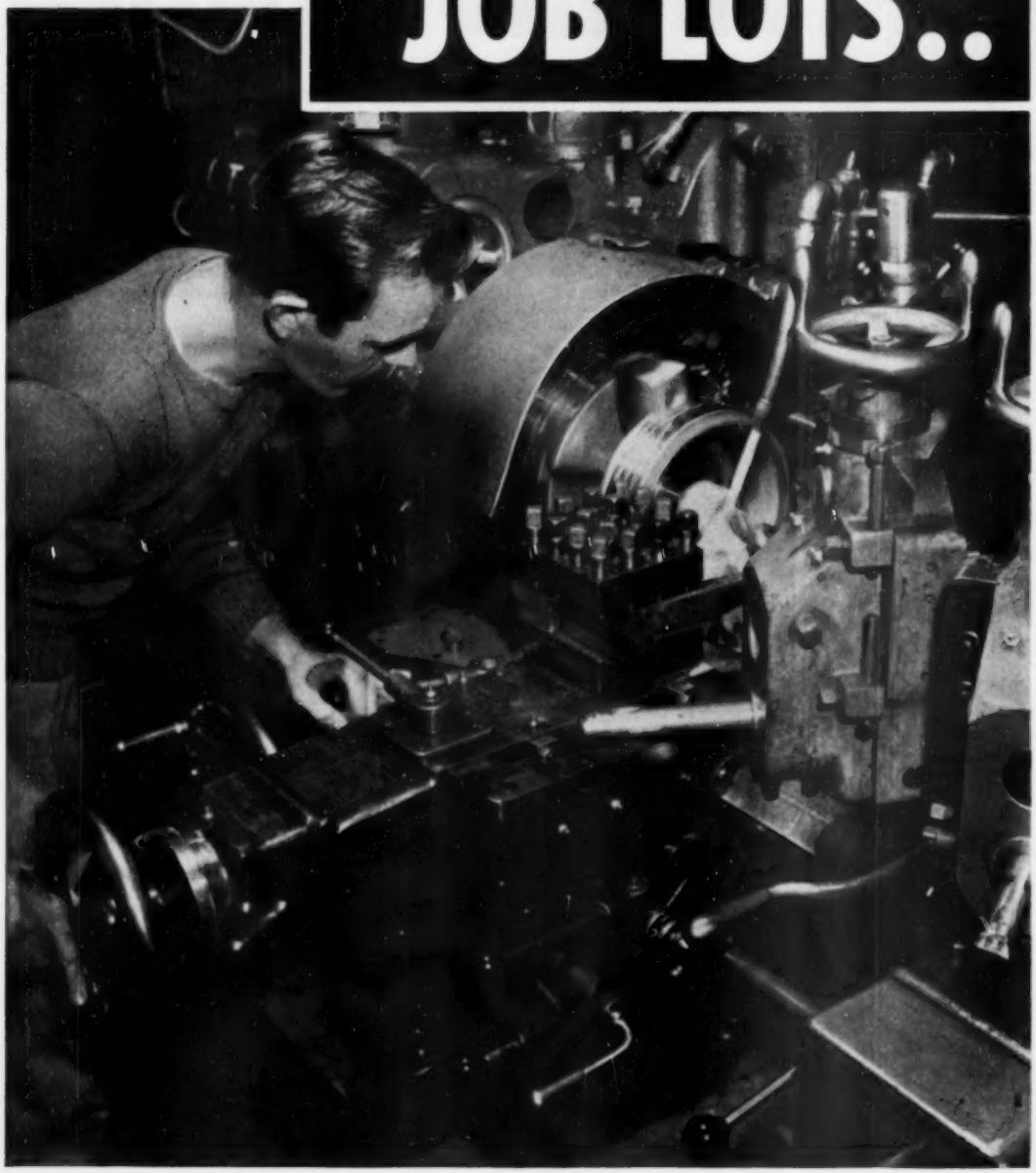
The completed mold. Note wheel mold parts. All contours for hubs, spokes milled on Rotary Head machine.



Here's one of the finished thermoplastic parts just as they come from the mold...ready to cut, trim and assemble.

Model 2D Rotary Head Milling Machine. Helps you machine production parts, dies, molds and other jobs by the Rotary Head Method.

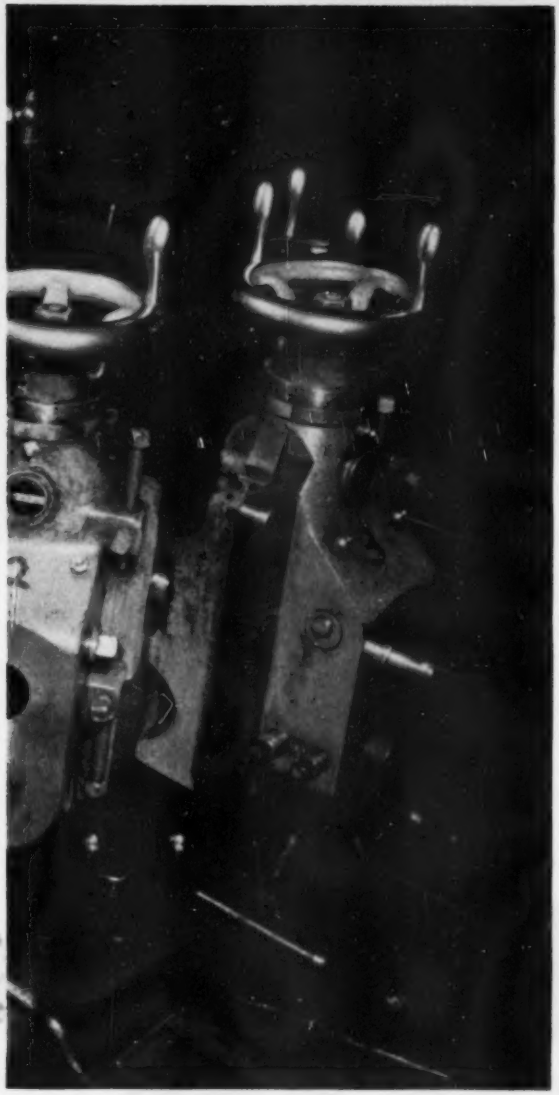
JOB LOTS..



A steel forged drive gear for Diesel locomotives being machined on a Warner & Swasey 1-A Turret Lathe. Limit: .0005" on O. D. of hub. Pieces in lot: 20. Repair parts for locomotives are also made on this machine.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

.LARGE OR SMALL



No Problem at American Locomotive

WHEN YOU MUST MACHINE a wide variety of jobs in various lot sizes—sometimes even single pieces—you must use turret lathes on which jobs can be set up quickly, changed with little downtime. American Locomotive has found they can handle these jobs *profitably* on Warner & Swasey Turret Lathes set up with Standard Universal Tooling.

At the Diesel Engine Division in Auburn, New York, six different model Warner & Swaseys are used on a variety of jobs ranging from lots of 6 to 500 pieces. Repair parts are also handled on these machines. These turret lathes turn everything from gray iron castings to tough alloy steels and hold limits of .0005".

American Locomotive experience proves jobs can be switched quickly on these Warner & Swaseys. Warner & Swasey power handles heavy multiple cuts. Warner & Swasey speed permits most efficient use of carbide tools. Rigid Warner & Swasey design guarantees lasting accuracy.

Warner & Swasey Turret Lathes have proved themselves profitable in handling precision jobs of many different kinds in thousands of plants—on job lots, large or small. So before you invest in any machine tools, call in your nearest Warner & Swasey Field Representative and find how Warner & Swasey can improve production and build profits for you.

WARNER & SWASEY
Cleveland

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

EVERYTHING UNDER CONTROL!

AUTOMATIC PUSH-BUTTON CONTROLLED MONA-MATIC TURNING GIVES COST CONTROL TOO— ON LONG AND SHORT RUNS

Here's high speed, automatic metal turning—every production man's dream—at its peak. Here's increased output combined with savings on setup, form tools, tool change and finishing.

The fast, powerful Mona-Matic utilizes the single Air-Gage Tracer controlled cutting tool on the front carriage for turning multiple diameters, tapers, faces, radii and chamfers. The fully automatic, integrated rear carriage tools perform necking, grooving and forming cuts. Template contours are reproduced generally to accuracies of + or —.001"—with the single, continuous tool cut providing a smooth, stepless finish frequently requiring no subsequent grinding.

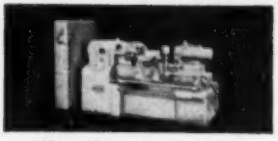
Here's a machine suitable for both first and second operation work, so completely automatic that one operator can easily service two—or more—machines. And because setup time is rarely over 25 min., *the production records it has set are as remarkable in short runs as long ones!*

Look over the exclusive features (listed, right) so important for success with the Mona-Matic. Then let us authenticate our story with actual production-line data that shows why Mona-Matic installations are replacing whole batteries of older equipment. Use the coupon now—and get the complete Mona-Matic story . . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

PRODUCTION TURNING AT ITS FINEST . . . THE MONARCH MONA-MATIC

Mona-Matic with Bar Feed.

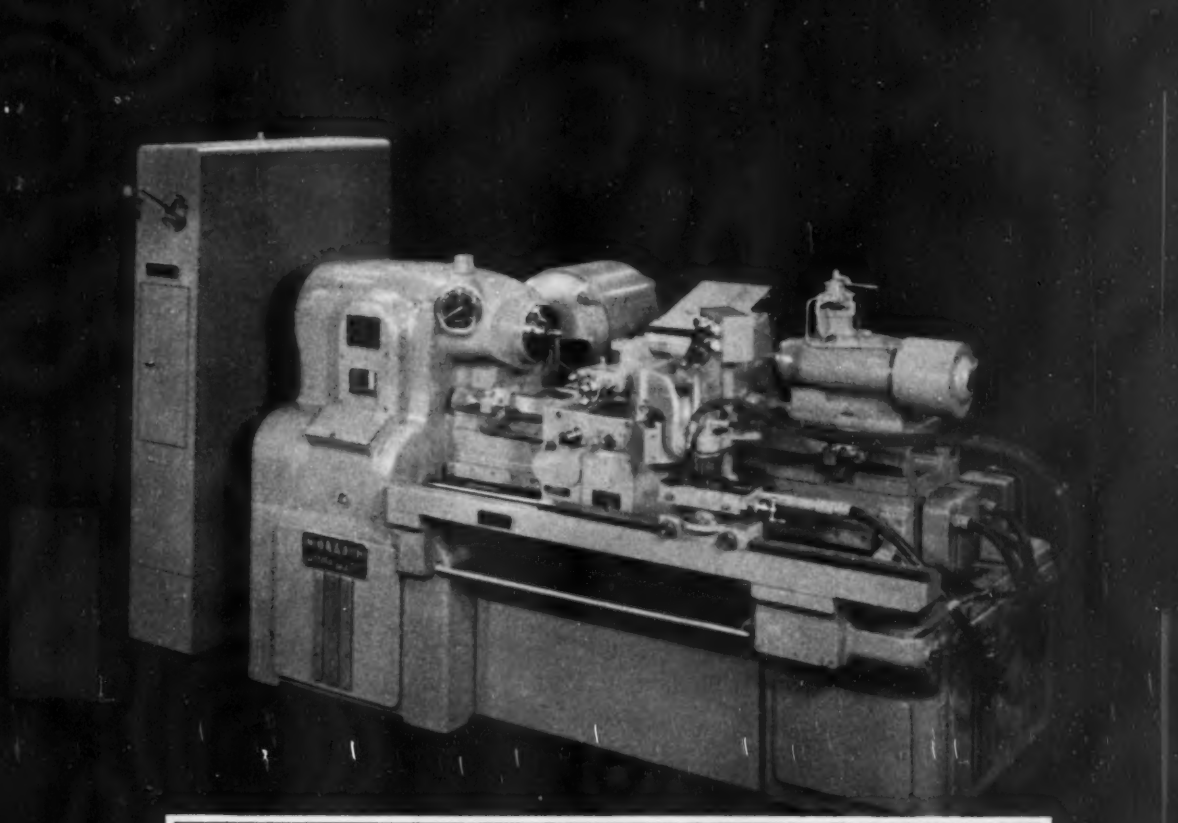
Mona-Matic with Magazine Load.



Mona-Matic with Cam Bar.

Model 15 Mona-Matic.

Mona-Matic with R-F Cycle.



EXCLUSIVE FEATURES FOR GREATER PERFORMANCE— YOU GET ALL THIS IN THE MONA-MATIC

1 Turning cycle is *completely* automatic, with rear slide operation, of course, included. The almost limitless number of cycle variations is made possible by Monarch's electronic controls. Automatic operation is foolproof, with possibility of damage or hazard virtually non-existent.

2 Wide feed range is infinitely variable. With optional automatic feed change feature, as many as five different feeds (up or down) may be used during the cut.

3 Higher speeds are available when needed—up to 3000 RPM. A 2-speed motor can also be supplied, an essential for efficient turning of many classes of work.

4 Accuracy far exceeding that of any other lathe duplicating method is provided by the Air-Gage Tracer. Operating on a stylus pressure of only 5 to 6 ounces, moreover, flat templates as well as round ones can be utilized with no appreciable template wear impairing accuracy even after the turning of thousands of pieces. This system, too, allows tracer replacement within a matter of minutes, if necessary.

5 Positive adjustment is provided for making diameter correction without influencing of length dimensions.

6 Design provides fall of scale and chips free of slides, prolonging accurate life of machine.

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio.

Gentlemen: I am interested in your Mona-Matic story and would like to receive your illustrated Booklet, with complete data and job performance reports. Please send me your Booklet 1805 without obligation.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

NEW! BARDONS & OLIVER Cutting-off Lathes Catalog

SEND FOR YOUR COPY ON COMPANY LETTERHEAD

- √ Capability of over 50 cycles per minute.
- √ Rapid Speed Changes through Sliding Gears combined with Reversible Pickoff Gears.
- √ Camless Hydraulic Feed to Double Tool Slides.
- √ Ample power to use either Roller Cutters or Carbide Cutoff Blades to full capacity.

BARDONS & OLIVER, INC.

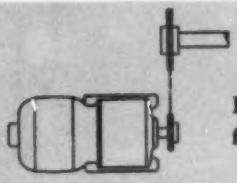
1134 WEST 9TH STREET • CLEVELAND 13, OHIO

Which of these speed reduction jobs is yours?

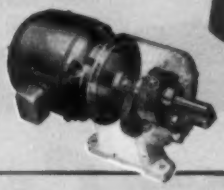
High-ratio reduction with right-angle takeoff?

Get a LINK-BELT Worm Gear Drive

Reduction ratios: 3.1:1 to 8000:1. Torque: 1400 to 123,000 in. lbs. Output shaft rpm: 0.22 to 564. Drawing shows motorized P.I.V. variable speed and worm gear drives direct-coupled.

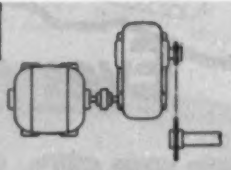


Restricted space for mounting?

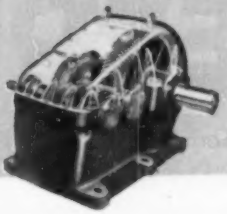


Get a LINK-BELT Gearmotor

Reduction ratios: 6.2:1 to 292:1. Hp range: 1 to 50. Output shaft rpm: 6 to 280. Drawing shows gearmotor with roller chain drive.



High hp with parallel shaft takeoff?



Get a LINK-BELT Herringbone Gear Drive

Reduction ratios: 2.84:1 to 318:1. Hp range: ½ to 1000. Output shaft rpm: 2 to 600. Drawing shows motor with herringbone gear and roller chain drives.

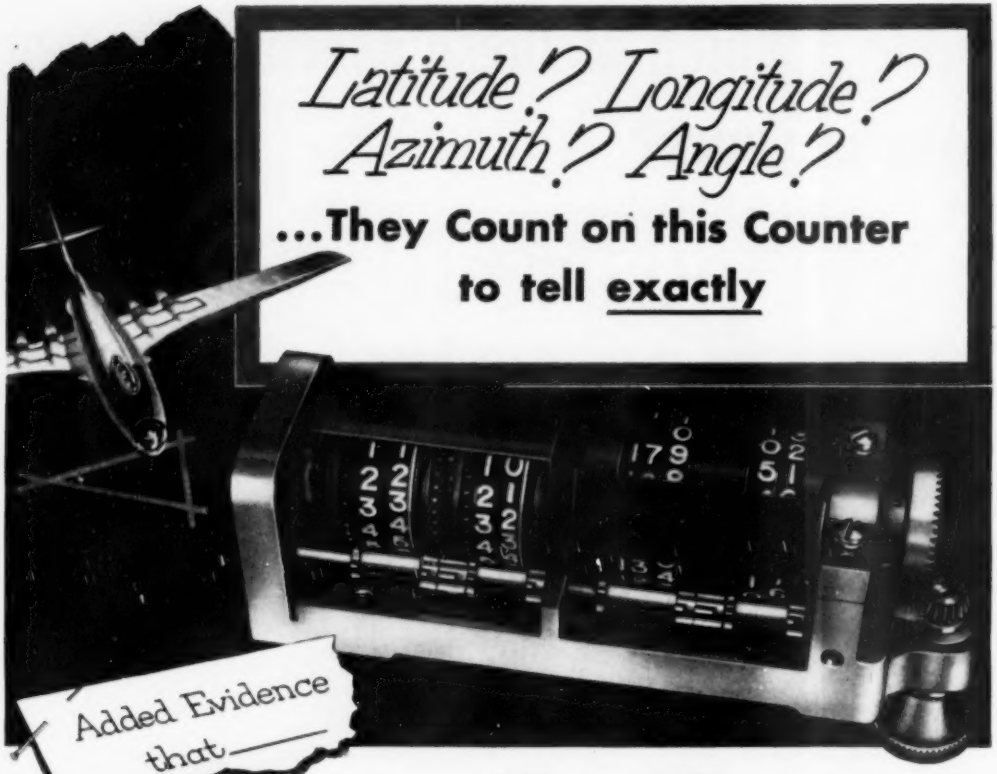
Yes, LINK-BELT builds all 3

NO LONGER need speed reduction be the limiting factor in a design or application problem. Because no *one* speed reducer solves every reduction problem, Link-Belt builds all three—Helical, Herringbone and Worm. Now it is only necessary to choose the right type of Link-Belt enclosed gear drive . . . and select the hp and reduction ratio that fit your requirements. You can get complete engineering information from the Link-Belt office near you.

LINK-BELT

ENCLOSED GEAR DRIVES

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities.



Everyone Can Count on VEEDER-ROOT

Aerial navigators and bombardiers rely on the figures that keep turning up on this Veeder-Root Counter, specially designed for the Armed Forces. And if *you* need to know exactly where you are, with any product or mechanism that's vital to Defense, then you can count on Veeder-Root to help you, to the utmost limits of ability . . . and of available capacity. Write:

VEEDER-ROOT INCORPORATED
"The Name That Counts"
HARTFORD 2, CONN.

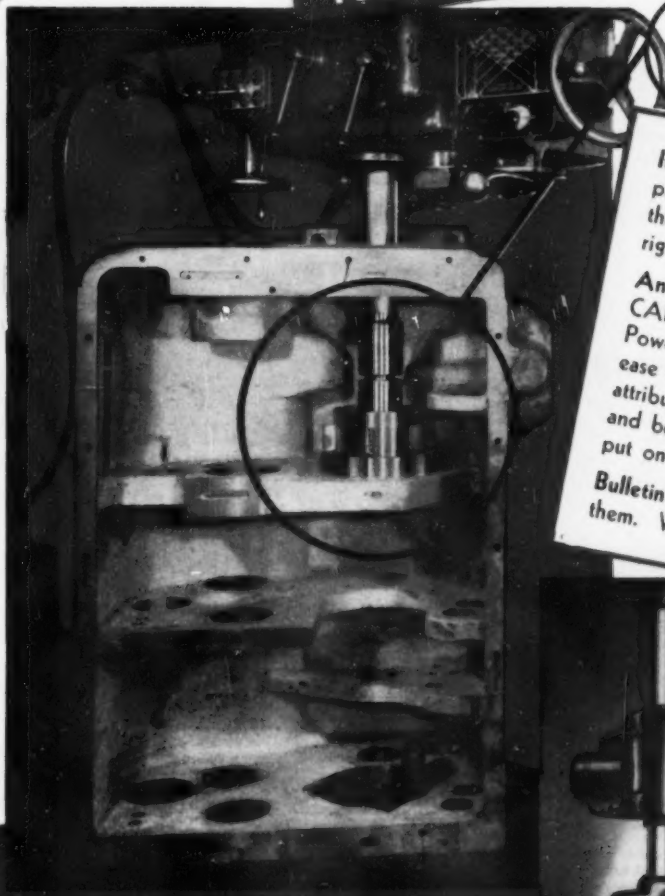
Chicago 6, Ill. • New York 19 • Greenville, S. C.
Montreal 2, Canada • Dundee, Scotland

Offices and agents in principal cities

"Counts Everything on Earth"

A GOOD SPINDLE

FOR GOOD BORING AND TAPPING . . .

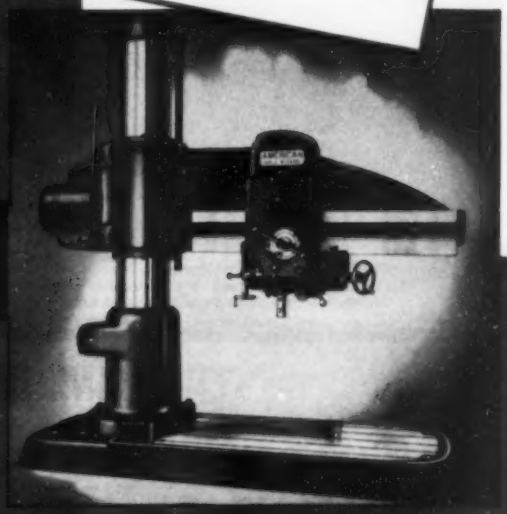


Here's a 10" tapping job on a 5-foot "AMERICAN" Hole Wizard Radial

It takes a sturdy, rigid machine with plenty of power to do work like this. Especially does it require a rigid and smooth-acting spindle.

And that's exactly what "AMERICAN" Hole Wizards are noted for. Power—rigidity—convenience and ease of control are "AMERICAN" attributes that cut drilling, tapping and boring costs wherever they are put on the job.

Bulletin No. 327 tells all about them. Want one?

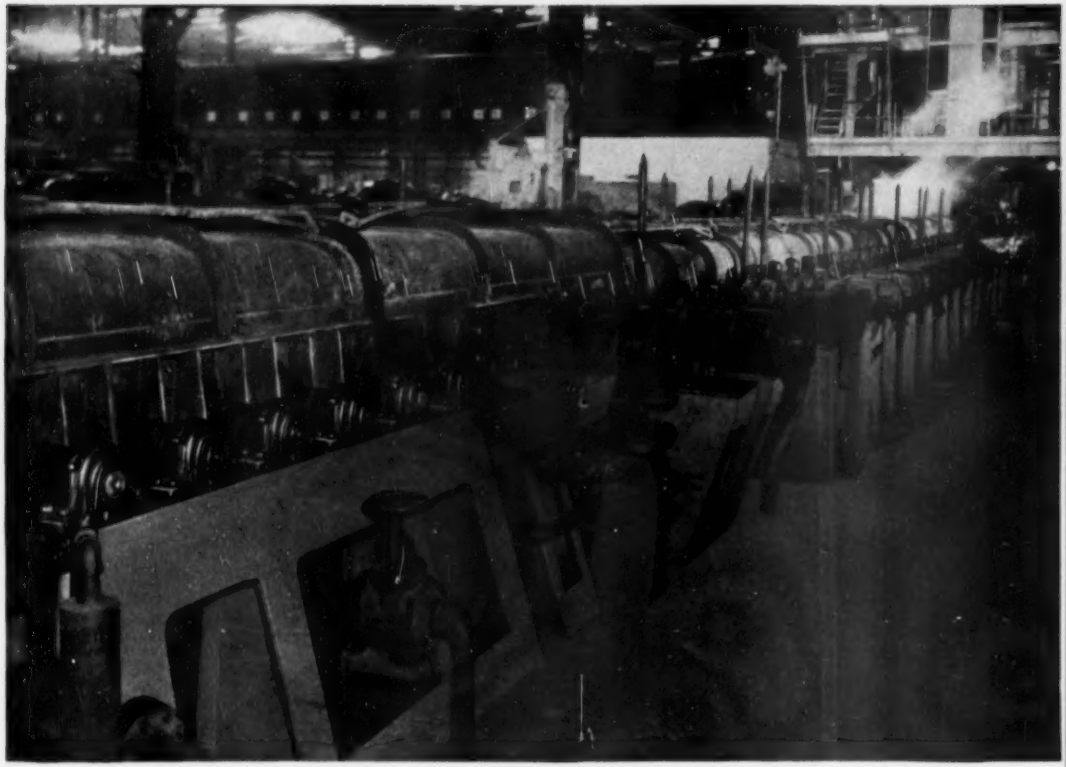


THE AMERICAN TOOL WORKS CO. **Cincinnati.Ohio U.S.A.**

Lathes and Radial Drills

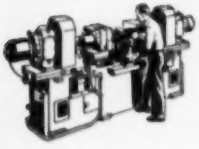
LINK-BELT ball and

...keep company with



Continuous steel strip is electrolytically tinplated at the rate of 1500 feet per minute on this modern new production line —almost twice the speed of previous comparable lines. A total of 330 Link-Belt Roller Bearings keep shafts turning smoothly. Shown above are pillow blocks supporting the shafts on each end of the 26 contact rolls.

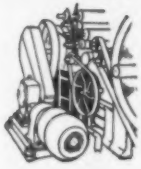
LINK-BELT ball and roller bearings



Metal Working Machinery

Farm Machinery

Construction Equipment



Textile Machines

roller bearings

America's hardest-working machines

The efficiency and life of any machine are dependent on the quality and accuracy of its bearings. That's why so many equipment designers specify Link-Belt on their heaviest-duty machines.

Link-Belt precision Ball and Roller Bearings have proved—on tens of thousands of applications—that they are the long-life answer for tough service. Integrally self-aligned, they have full load capacity for both thrust and radial loads.

There are Link-Belt ball or roller bearings to meet every industrial need, and a Link-Belt bearing specialist near you will help apply them to your particular requirements. You can also get all the facts from Data Book 2550.

CUTAWAY OF SERIES 6900-6900
TWO-PIECE ROLLER BEARING PILLOW BLOCK
Self aligning—inner raceway is truly spherical, free to move in any direction without altering contact area with rollers. Full load capacity always assured even with shaft deflection or misalignment.
Jack screw holes are provided for easy removal of housing cap.
Tapered adapter sleeve provides positive concentric mounting on commercial shafting.
Large reservoir prolongs lubrication intervals.
Easily installed by removing housing cap, slipping adapter assembly onto shaft and locking in position.
Sturdy, two-piece cast housing facilitates installation, inspection and disassembly.
Seals effectively keep lubricant in, dirt out.
"Housing sealing" feature fully protects and lubricates all moving surfaces.
Slotted bolt holes facilitate mounting on supporting structure.

One of many types in the Link-Belt line of Pillow Blocks, Flanged, Flanged Cartridge, Cartridge, Hanger, Take-Up Blocks and Unmounted Bearings.

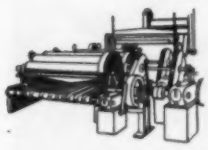
LINK-BELT

BALL and ROLLER BEARINGS

12,840

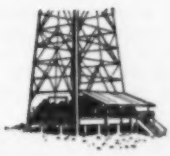
LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities.

smooth the path of power for all industry

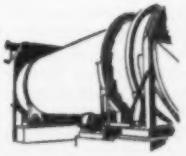


Pulp & Paper Machinery

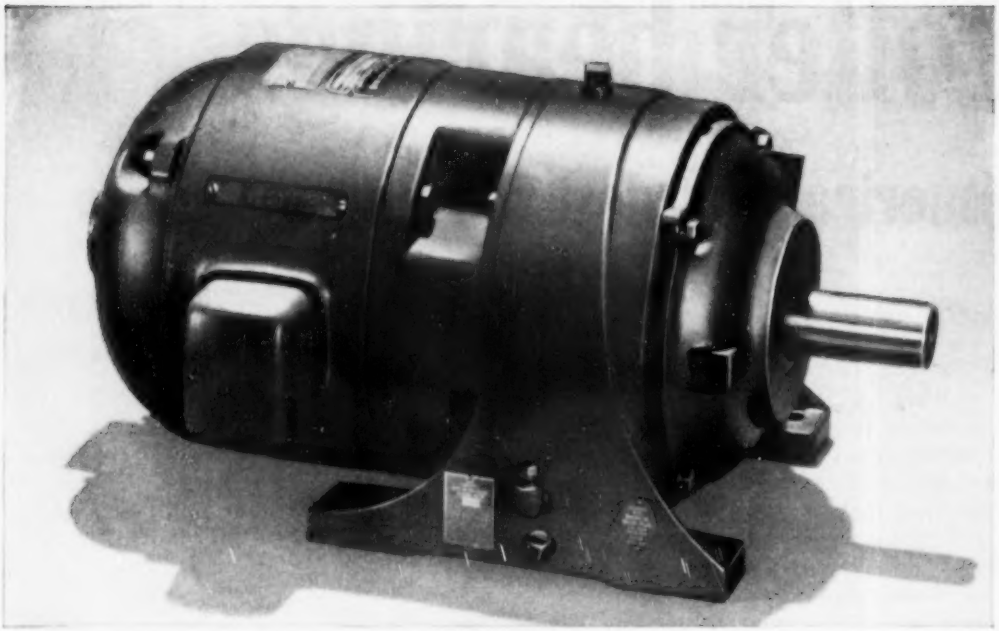
Materials Handling Equipment



Oil Field Equipment



Processing Equipment



G.E. Announces Improved Gear-motor Design

Maintenance costs and time cut more than 50% by new gear-motor

General Electric's improved gear-motor is a single unit—a superior low-speed drive, now redesigned to further reduce maintenance costs. Here's how!

STATOR REMOVAL may now be accomplished without disturbing the gear train in any way. Simply remove the endshield, the four bolts which secure the stator, and pull off the stator. Because this is part of the complete line of *standard* G-E motors, you can use *any* G-E motor stator of the same size as a replacement.

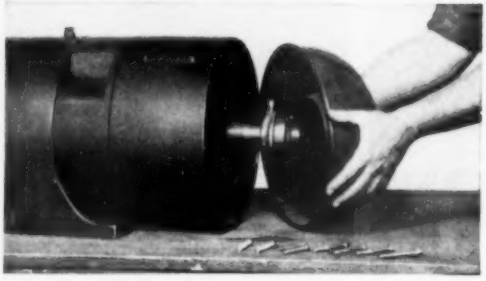
TRI-CLAD* MOTORS—the most reliable, most widely-accepted motors available—are now an integral part of *every* G-E gear-motor, either open or totally enclosed. All open gear-motors have dripproof construction.

PROMPT SHIPMENT is made possible by G.E.'s new stocking plan, which keeps popular ratings stocked at multiple points throughout the country. In addition, over 250 models are now on a one-week shipping schedule from the factory.

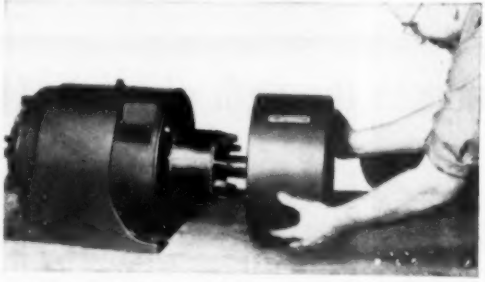
G-E gear-motors, being single units, are easier to install and maintain than motors coupled to separate, external gear reducers. They're available in standard enclosures to fit any application. Order your G-E gear-motor through your nearest G-E Apparatus Sales Office, or your Authorized G-E Agent or Distributor. General Electric Company, Schenectady 5, N. Y. 755-9

*Reg. trade mark of General Electric Co.

GENERAL ELECTRIC



ENDSHIELD REMOVAL is a simple matter. Remove the bearing-cap and endshield bolts, and lift the endshield from the stator.



STATOR REMOVAL now consists of just removing the four stator bolts and slipping the stator from the gear-motor housing.

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

COST-SAVING SETUP FOR MACHINING BOTH ENDS AT ONCE

Shows Value of Proper Tool Planning with Versatile Lathe

You can see real thinking has gone into this setup for machining tractor rear axle housings. As the result, this Simplimatic Automatic Lathe is simultaneously machining the two end flanges in a single, fast operation.

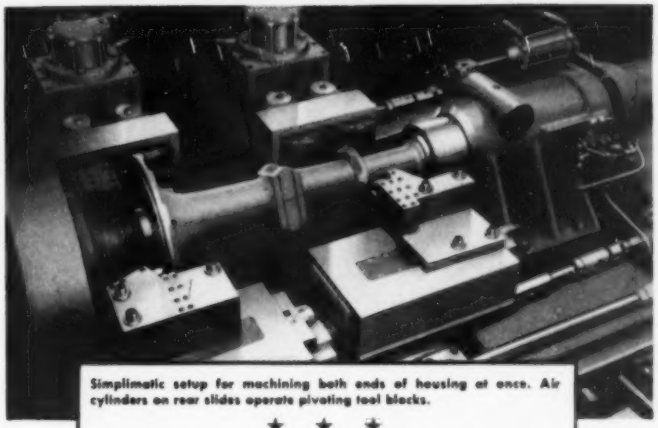
Work is divided between the four slides. All turning and some chamfering are done by the two front slides. The two rear slides take care of the straddle facing . . . doing it in an extremely clever way. Each of these rear slides consists of a pair of pivoted tool blocks which have a scissors-like action.

Tool Blocks have Two Sections

The two *right* rear tool blocks are tightly wedged together at the start of the cut. When straddle facing is completed they spring apart, providing tool relief for the withdrawal.

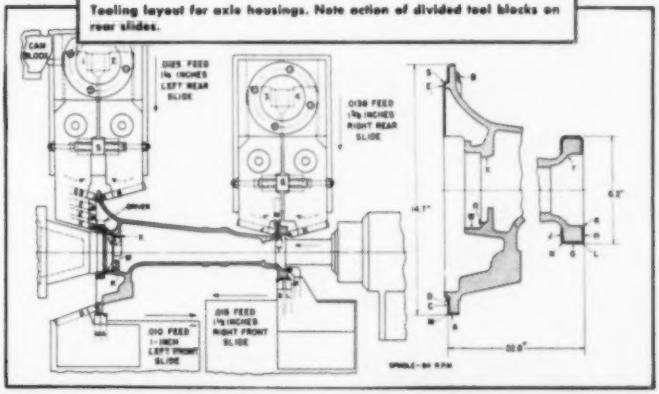
There's a different action to the two *left* rear tool blocks. Here, the tool blocks are partially wedged together as the slide feeds the tools into the work. As the slide continues to feed forward, the straddle facing tools are brought closer together. This splits the wide facing cut among three tools. At the completion of the cut, the tools spring apart for tool relief. Floor-to-floor time for the entire automatic operation is 1.33 minutes.

Pivoting tool blocks on this Simplimatic job provide the answer for machining both flanges in a single operation.



Simplimatic setup for machining both ends of housing at once. Air cylinders on rear slides operate pivoting tool blocks.

★ ★ ★


CAM BLOCK
DIES FEED 1⅝ INCHES LEFT REAR SLIDE
DIES FEED 1⅝ INCHES RIGHT REAR SLIDE
DIE FEED 1 INCH LEFT FRONT SLIDE
DIE FEED 1⅝ INCHES RIGHT FRONT SLIDE

Tooling layout for axle housings. Note action of divided tool blocks on rear slides.

Other interesting jobs . . . handled on the Simplimatic Automatic Lathe, plus full information and specifications are yours in the all new Simplimatic catalog just off the press. Ask for your copy.

GISHOLT

TIME-SAVING IDEAS

AUTOMATIC LATHE TURNS OUT PARTS IN PAIRS

Tooling Arranged for Handling Related Parts with One Setup

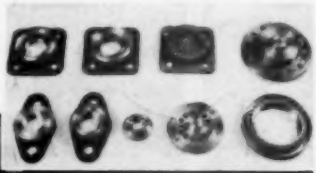
Here's a 1F Fastermatic Automatic Turret Lathe specializing in the production of a wide assortment of mating parts. The steel forgings are handled in lots of 200 pieces—100 male and 100 female parts.

Simple tooling takes care of the simple operations involved. Just two faces of the hexagon turret are needed for each part . . . but the handling of alternate male and female parts keeps four turret stations busy.

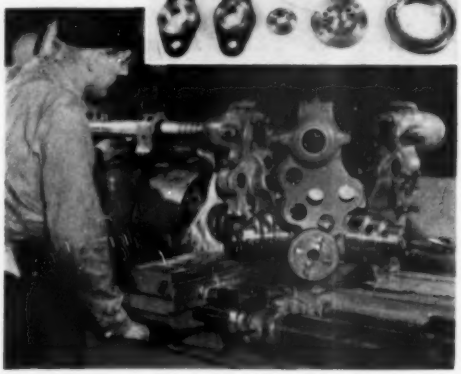
The photo shows a male flange being formed. This is followed by a drilling operation. After that, the operator removes the male flange and chucks a female flange (using same chuck jaws). Passing the next turret face, work is then begun on this flange. From stations four and five the female flange is drilled and faced. Turret station six is then passed and the operation is complete . . . and a male flange is again handled.

The nice feature of this setup is that with one set of tools on the machine, you complete *two* mating parts. This way you're always sure the parts will match perfectly. Moreover, since alternate pieces are machined, there's no problem in keeping quantities even. Total time for a pair of these parts is an even 5 minutes.

Typical parts handled in pairs on the Fastermatic.



Small parts, even in small lots, are economically produced in pairs by the Fastermatic Automatic Lathe.



Male flange being formed. After next drilling operation, female flange is machined. Then male flange again.

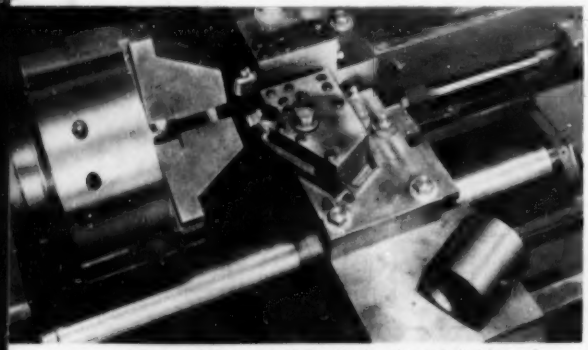
PISTONS BORED AND CENTERED IN 1ST OPERATION

No. 12 Hydraulic Automatic Lathe Combines Machining of Skirt and Centering of Dome

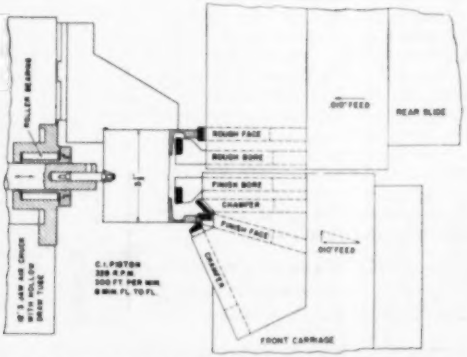
The main operations are on the skirt end of this cast iron tractor piston. The rear slide feeding longitudinally rough bores and faces the skirt. As this slide withdraws, the front carriage moves longitudinally to finish bore and chamfer the ID. It then swings in to finish face and chamfer the OD. It is then withdrawn from the position to provide tool relief.

After operations on the piston skirt, the No. 12 Hydraulic completes its job by centering the piston dome. This is handled by the back boring attachment in the spindle. Floor to floor time is .8 minute. Several sizes of pistons are handled by this No. 12 Hydraulic, all with fully automatic operation.

Combining boring of skirt and centering of dome saves time and provides complete concentricity for following machining operations.



Close up of Tooling for boring and facing skirt end of piston and centering dome end.



Cast iron tractor piston job on the No. 12 Hydraulic Automatic Lathe.

GISHOLT

LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT

GISHOLT

TIME-SAVING IDEAS

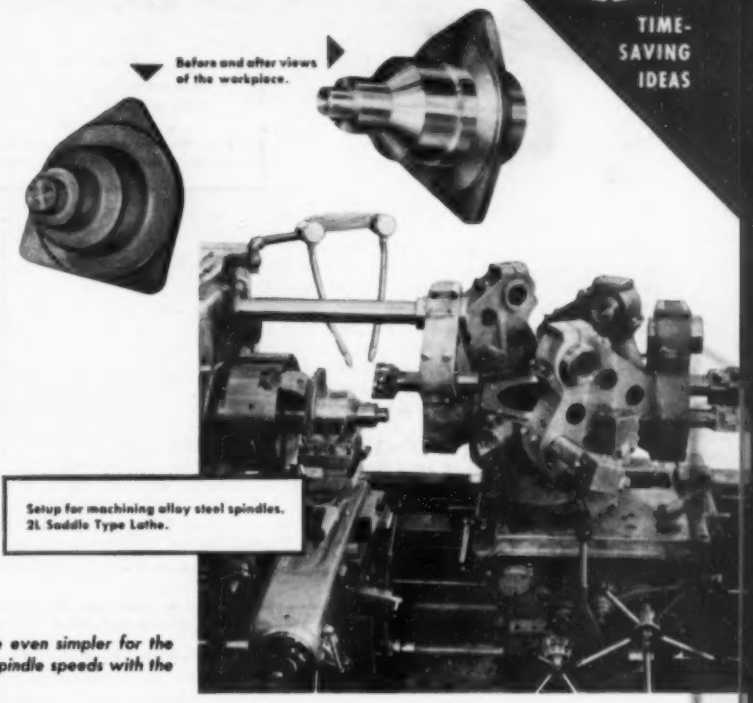
EASY DOES IT...WITH A 6-SPEED CHANGE OF PACE

Saddle Type Turret Lathe Cuts Time Lag with Speed Selector

While the operations needed to finish these spindles are all relatively simple, the job could be a trouble-maker on a less able machine than this 2L Saddle Type Turret Lathe.

Here's why: The part's a tough steel forging weighing in at 103 lbs. and finishing at 93 lbs. Not much stock removed, to be sure, but it takes carbide to do it. The workpiece is chucked on the previously turned short rear hub with a standard 3-jaw air chuck to speed up handling. Standard tools are used to finish all twelve outside diameters.

With the many diameters to be machined on the part, six different spindle speeds are required . . . an easy matter for the Gisholt with its Hydraulic Speed Selector which gives instant, accurate speed changes. Floor-to-floor time for these husky parts is an easy 14.5 minutes.



Before and after views of the workpiece.

Setup for machining alloy steel spindles. 2L Saddle Type Lathe.

Simple operations on these parts are made even simpler for the operator because of the ease of changing spindle speeds with the Gisholt Hydraulic Speed Selector.

A LITTLE EXTRA TOOLING—A LOT OF EXTRA PRODUCTION

Ram Type Turret Lathe Completes Pulleys in Single Chucking

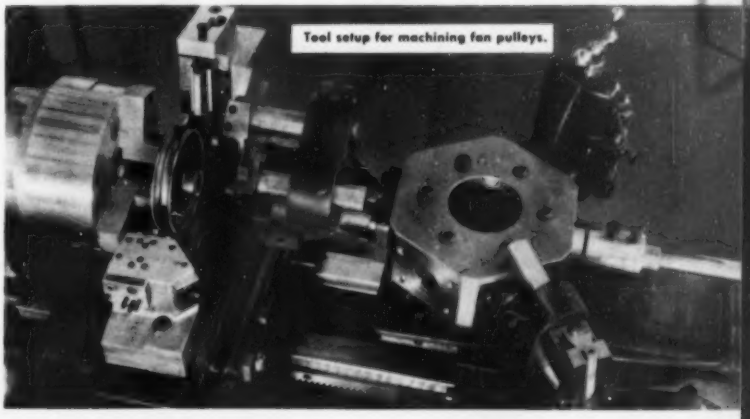
Here's another example of where careful attention to tooling is paying off in increased production. The part is a V-belt pulley and the machine is a standard No. 3 Ram Type Turret Lathe.

The part is held in special top jaws on a standard Gisholt 3-jaw scroll chuck. All boring, turning and facing of the hub are handled by multiple tooling on three faces of the hexagon turret. The large OD is also turned from here.

Special tools are used on the cross slide. In place of the standard quick-indexing tool post on the front of the slide, there is a special tool block. These tools not only rough out the groove, but straddle face the sides as well.

On the rear of the cross slide is another special tool block. Tools here finish-form the groove and finish-straddle face the flanges.

By using special tool blocks on both the front and rear of the cross slide, all machining on these pulleys is done in one chucking.



Tool setup for machining fan pulleys.

GISHOLT

GISHOLT

TIME-SAVING IDEAS

TAKING THE TROUBLE OUT OF TAPPETS
. . . WITH SUPERFINISH

9 Spindle Superfinisher Does High Volume Work

Here's another forward step for extending and improving engine performance. This time it's valve tappets that are being Superfinished. Doing this high production job is a Model 53A Superfinisher. Here's how it operates:

The machine has nine spindles in a rotating base. This operates continuously, like a "merry-go-round." Each work spindle has a collet to hold the tappet. Above is a Superfinishing head. Collets and heads rotate in opposite directions. During the machine cycle the flat Superfinishing stones scrub off the amorphous metal on the cam surface of each tappet.

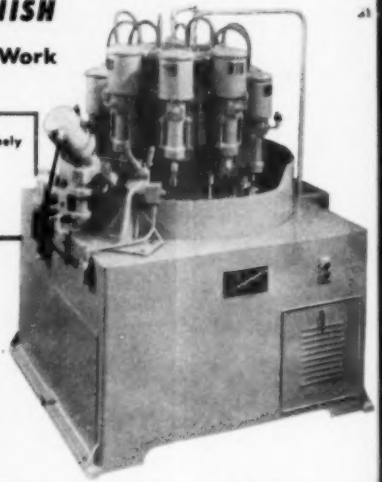
Superfinishing complete, the head is raised and an angular head comes in to chamfer the corners. Then, as the spindle returns to the unloading position, rotating stops, the collet opens, and the tappet is partially ejected. The operator then takes out the finished tappet and replaces it with an unfinished tappet. Production is 600 to 800 parts per hour.

Superfinishing is solving "wearing" problems in many industries.

Superfinisher produces 600 to 800 finely finished valve tappets per hour.

★ ★ ★

Close-up showing special Superfinishing unit for chamfering OD of tappets.



The textbook *"Wear and Surface Finish"* gives the complete story. Ask for your copy.

Better, longer lasting valve tappets are produced in this high production Superfinishing setup.

FLYWHEELS IN ALL SIZES BALANCED ON THIS ONE MACHINE

Handled on Efficient Production Basis

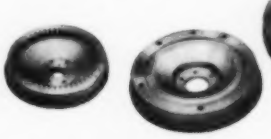
Here is the way flywheels in a large variety of sizes are balanced by a well known engine manufacturer. A Gisholt DYNETRIC Type UV1 Balancing Machine takes care of all production, with parts weighing from 25 to 400 lbs.

A roller and guide arrangement, adjustable to handle flywheels from 8½" to 32", carries the flywheels from the assembly line to the machine and back. As the flywheel is located in position on the Balancer, a hydraulically operated mechanism raises it from the rollers for support by the spindle.

After the quick balancing operation is completed, the flywheel is turned to the indicated angle of unbalance. A sliding prick-punch, which can be set at any radius from 4" to 16" from true center, is then moved to the proper location and activated to mark the spot on the flywheel bottom where drilling correction is made.

This balancing operation, which is part of assembly line operations, results in smoother engine performance, less engine vibration.

DYNETRIC BALANCERS GISHOLT



Type UV1 Balancer for balancing tractor engine flywheels.

A few of the many sizes of flywheels balanced.

No 11-1252

603

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

How a carbide die outperforms a steel die by 25 to 1 for Schick, Inc.

In past six years, a Carboloy die (shown at left) produced over 62,500,000 parts with only 25 regrinds. It saved 4,375 hours of steel-die regrinding time . . . saved 900 hours of press setup time because of longer production runs. Carbide die produces over 2,500,000 pieces per grind . . . steel die, less than 100,000.

Carboloy Cemented Carbide die built for Schick, Inc., in 1946 by Lincoln Park Industries under direction of Mr. George F. Eglinton. Die is still in daily use.

You get more carbide benefits with Carboloy dies and services!

For blanking, forming, drawing and piercing dies that will stand up under terrific hour-after-hour pounding . . . always specify Carboloy Cemented Carbide.

It's quality-controlled by 29 rigid, probing tests that stem from Carboloy experience as world's largest maker of cemented carbides.

You get extra die life from Carboloy Cemented Carbide — hardest metal made by man — because extra life is built into it!

Carbide benefits

You or your die maker may order Carboloy Cemented Carbide made to your specifications in rough-finished form. You get all carbide benefits . . . and final finishing and assembly into your dies are easily done in your own toolroom, or by your die maker.

Carbide specialists

Carboloy Field Engineers are ready with on-your-job solutions to tough die problems . . . and ready to help you design new carbide applications.

Carbide training

Your key toolroom personnel can learn latest carbide techniques, become expert in finishing and servicing carbide dies at the Carboloy Customer Training School.

Carbide data

For a handy, all-inclusive guide showing how easy it is to design, use and maintain carbide dies, write for the Carboloy Die Engineering Manual, D-124.

To get the complete story of how Carboloy dies and engineering services offer more carbide benefits . . . greater production with less downtime and maintenance . . . fewer rejects and less refinishing . . . call in your local Carboloy representative or use the handy coupon below.

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11149 East 8 Mile Road, Detroit 32, Michigan

Plants at Detroit, Michigan; Edmore, Michigan; and Schenectady, New York

Magnet ideas for the shop!

Use Carboloy Permanent Magnet Sheet-Steel Separators to prevent feeding of doubles. And use permanent magnets to give an extra hand all around your shop. They're great for magnetic stands, tool-holding devices, sweepers' pickup tools, magnetic paper grippers, containers for small parts and magnetic retrievers. Write for Carboloy Permanent Magnet Stock Catalog, PM-100. (Use coupon.)

CARBOLOY Department of General Electric Company
11149 E. 8 Mile Road, Detroit 32, Michigan

We are interested in the Carboloy services checked below:

☐ Die Training School ☐ Die Engineering Manual, D-124 ☐ Permanent Magnet Stock Catalog, PM-100 ☐ Have a Carboloy Field Engineer call.

Name _____ Position _____

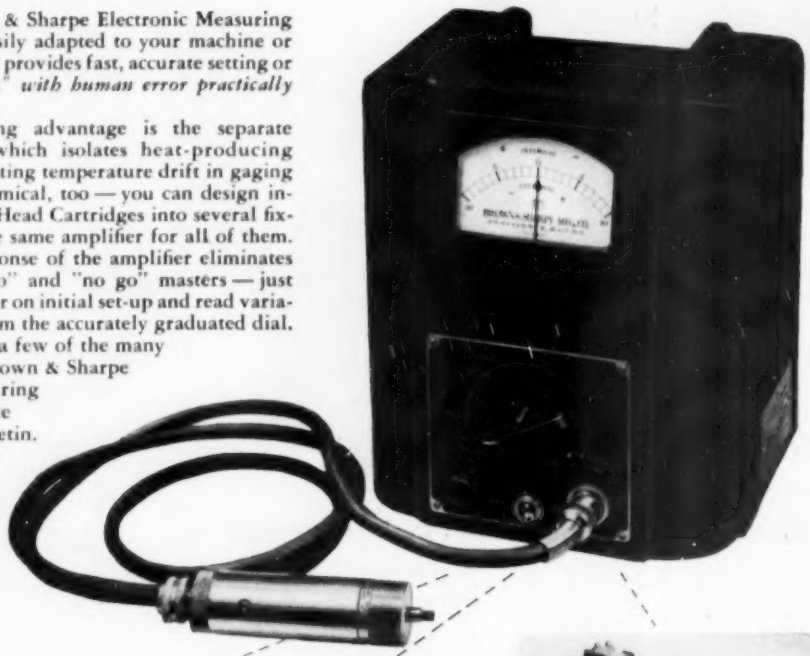
Company _____

Address _____

City _____ Zone _____ State _____

Build "tenths of tenths" measuring into your equipment

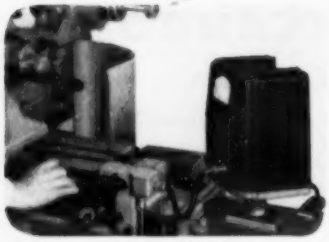
Brown & Sharpe Electronic Amplifier No. 950 for .0001" to .00001" readings. Gage Head Cartridge No. 953 is plugged in.



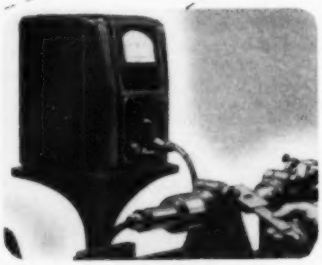
Versatile Brown & Sharpe Electronic Measuring Equipment is easily adapted to your machine or fixture design. It provides fast, accurate setting or gaging to .00001" *with human error practically eliminated.*

An outstanding advantage is the separate amplifier unit which isolates heat-producing elements, preventing temperature drift in gaging units. It's economical, too — you can design inexpensive Gage Head Cartridges into several fixtures and use the same amplifier for all of them. True linear response of the amplifier eliminates the need for "go" and "no go" masters — just "zero" the pointer on initial set-up and read variations directly from the accurately graduated dial.

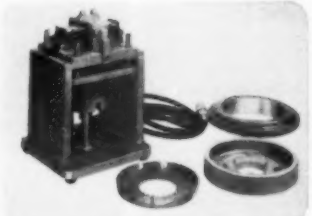
These are but a few of the many advantages of Brown & Sharpe Electronic Measuring Equipment. Write for detailed Bulletin. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



Electraligo — an application of this precision electronic equipment in Brown & Sharpe's own grinding machines. Permits fast, accurate setting of swivel table for precision grinding straight work or exact tapers after a single trial grind.



Gage Head Cartridge No. 953 mounted on fixture to measure a fixed gage . . . used with Amplifier No. 950. Standard comparaters for external or internal measuring also available.



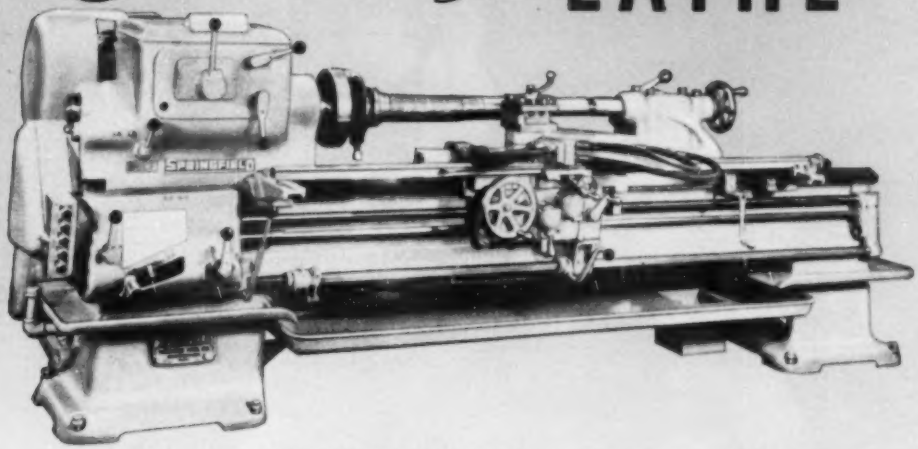
Special fixture utilizes Gage Head Cartridge and Amplifier to measure internal angle accuracy to ± 1½ seconds independently of bore size and without reference to locating surface.

WE URGE BUYING THROUGH THE DISTRIBUTOR

Brown & Sharpe B·S

SPRINGFIELD

Contouring LATHE



***The* simplicity of the SPRINGFIELD Hydraulic Contouring Attachment is outstanding. Pilot or control circuits, remote control valves and other troublesome elements are eliminated. A motor driven hydraulic pump, relief valve and oil reservoir are the self-contained power unit furnishing hydraulic pressure to the servo-valve and full universal hydraulic compound rest. A supported and guided adjustable template holder conveniently holds templates at the front of the lathe in full view of the operator. There are no complicated mechanisms or fragile units.**

SPRINGFIELD Hydraulic Contouring lends itself perfectly to lower production costs per unit on large or small runs.

Opposed hydraulic pressures in the hydraulic cylinder hold the slide solidly for heavy duty cutting.

Full universal hydraulic compound swivels to the best angle for contouring each individual job.

Standard SPRINGFIELD Lathes with swings from 14" to 32" are used in conjunction with the hydraulic contouring attachment thus giving complete standardization of components.

Quick changeover from standard SPRINGFIELD Engine Lathe operation to contouring is made easily.

Positive, smooth, continuous, backlash-free hydraulic movement gives superior finish on turning, boring or facing.

Close coupling of stylus, servo-valve and cylinder eliminate long hydraulic lines, sluggish action and resulting inaccuracies. The SPRINGFIELD Hydraulic Contouring attachment does not reduce the normal swing capacity of the lathe.

Write for Bulletin No. 184

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

Is your present abrasive method

Only CARBO

TRADE

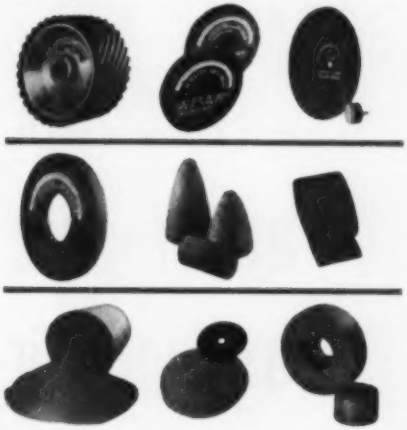
"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York

really good enough, today?

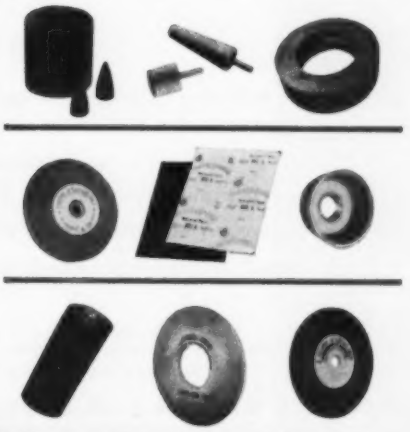
Chances are good that if you've been using the same method for a mere two years, there's now a better way. That's how thick and fast the new developments in abrasive techniques have come along. Every day someone, somewhere, is switching from one method to another, under the pressure of one hard economic fact: the need to cut costs.

Here lies the biggest advantage to the shop which has standardized on abrasives by CARBORUNDUM. You get counsel free from bias, for the CARBORUNDUM distributor or salesman represents the only producer of a complete branded abrasives line, famous for uniform high quality. Thus he can recommend on the basis of what's most profitable for you, not just what's most profitable for him. And he can keep you posted on all the newest practices of metalworking shops from coast to coast.

Make a mental run-down today of each abrasive operation your shop performs, then call in the man from CARBORUNDUM for his experienced, practical, unbiased counsel. You'll find him listed in the yellow pages under "Abrasives." Call him today—it's to your profit!



Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM



RUNDUM

MARK

offers ALL abrasive products...to give you the proper ONE

THIS IS

Fosdick automatic positioning

1

2

- Duplicates precision bored, drilled and tapped parts—weeks, months or years apart!
- No jigs needed!
- Automatically positions to ±.0001"!
- Production boosted as much as 250%!
- Doesn't require experienced operators!

THE FOSDICK MACHINE TOOL COMPANY
DEPARTMENT A
CINCINNATI 23, OHIO

Gentlemen: Please send me catalog 17P containing complete and detailed information on the Fosdick Automatic Positioning Machine.

NAME .....

TITLE .....

COMPANY .....

CITY ..... ZONE ..... STATE .....

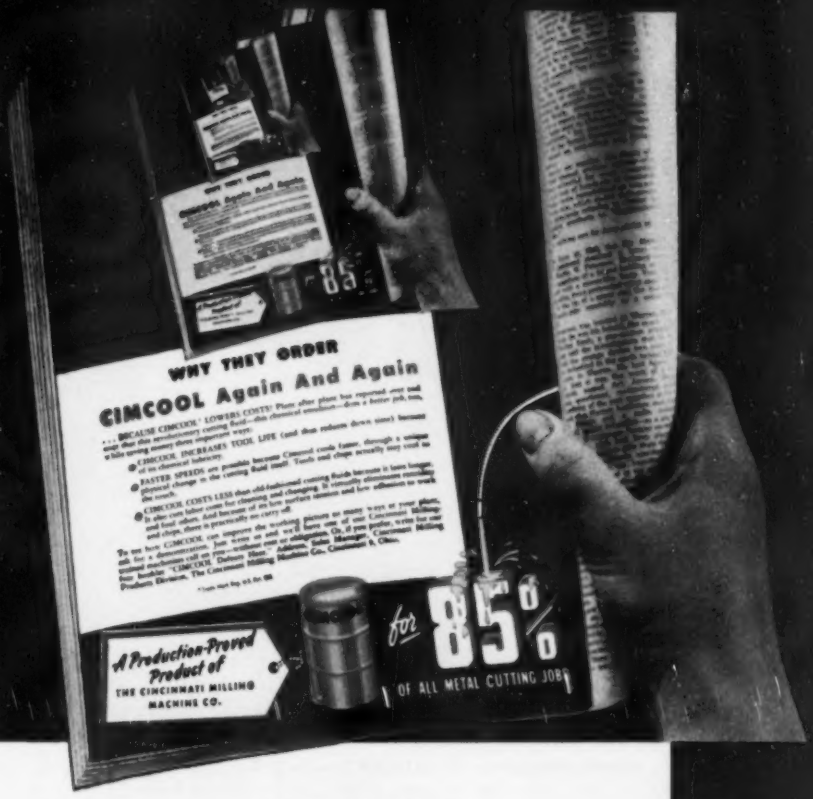
CLIP COUPON . . . MAIL TODAY!

DEPT. A,

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

Radial Drills
Sensitive and Upright Drills
Jig Borers
Automatic Positioning Machines
Sensitive Radial Drills



WHY THEY ORDER

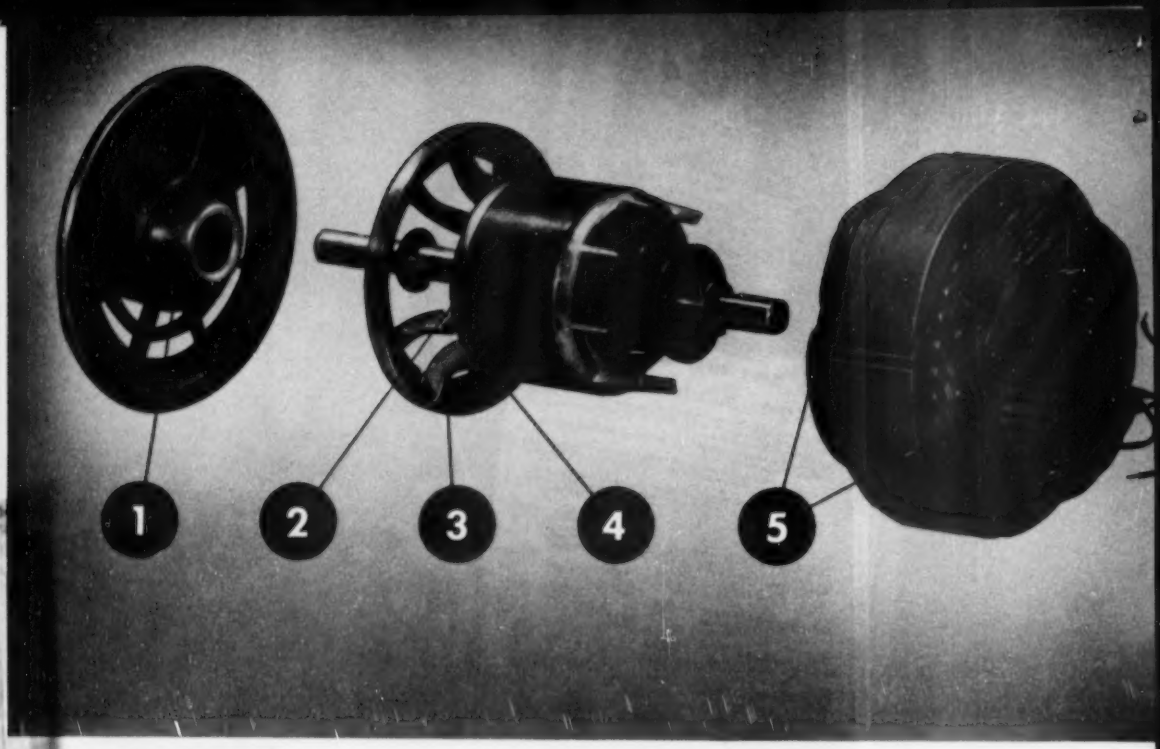
CIMCOOL Again And Again

. . . BECAUSE CIMCOOL* LOWERS COSTS! Plant after plant has reported over and over that this revolutionary cutting fluid—this chemical emulsion—does a *better job*, too, while saving money three important ways:

- CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its chemical lubricity.
- FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

To see how CIMCOOL can improve the working picture so many ways at your plant, ask for a demonstration. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "CIMCOOL Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

* Trade Mark Reg. U.S. Pat. Off.



1. VERSATILE!—All-angle bearing and lubrication system permits motor to operate in any position.

2. SMOOTH RUNNING!—Precise rotor balancing and concentricity of rabbets and bearings.

3. EFFICIENT!—New electrical design, ventilation give top performance in least space.

4. QUIET!—Advanced magnetic design and unitized rotor-fan casting provide quiet operation.

5. LONG-LIFE!—*ALL* synthetic insulation resists moisture, corrosion and electrical breakdown.

Ten good reasons for using

Above you see ten good, basic reasons for using the all-new G-E "form G" motor—right now! And at your right are four big "plus" reasons perhaps even more important to you.

Completely different . . . completely *functional* . . . this general-purpose motor gives you full NEMA performance plus up to *50% less weight, 40% less bulk—rating for rating!*

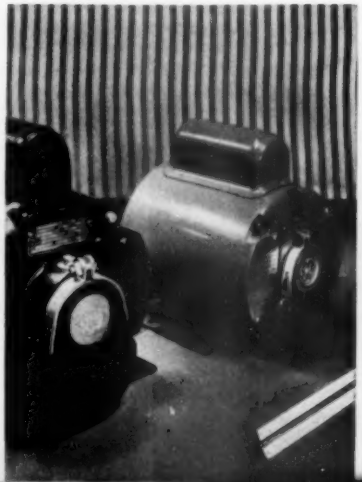
You get efficiency, sturdiness, extra long life . . . *plus quiet, all-angle operation in every rating!*

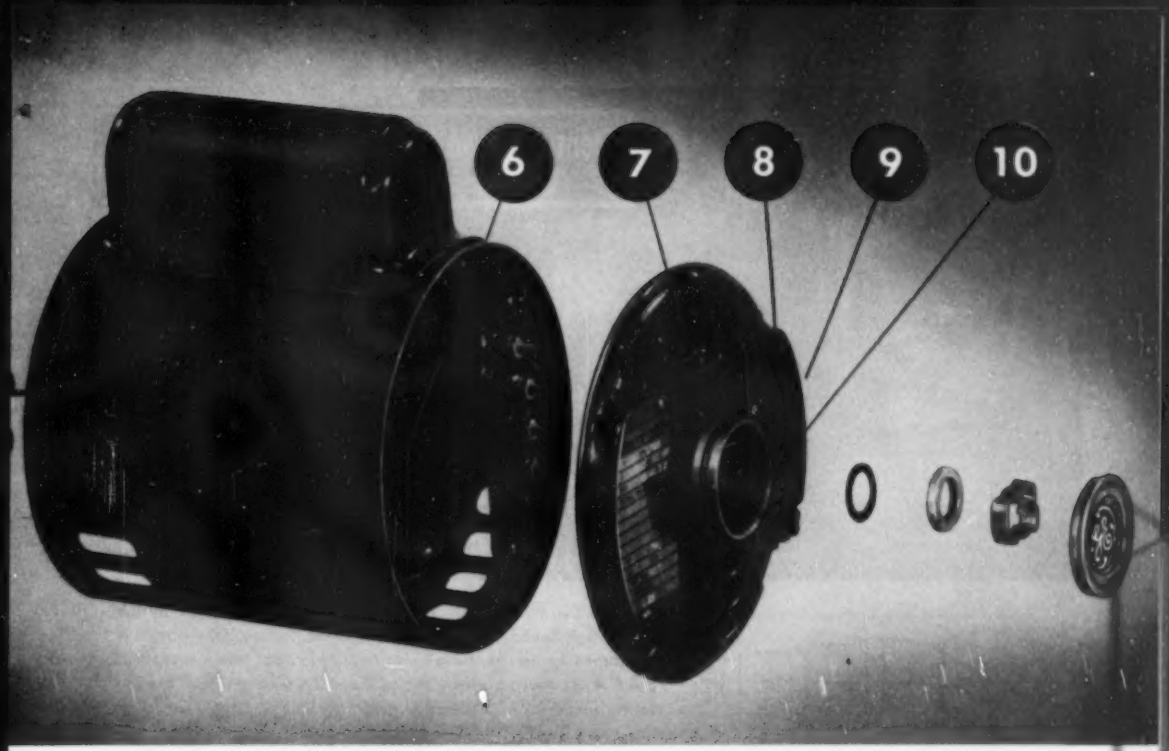
Now you can improve your product, speed assembly time, cut your handling and shipping costs.

Want more good reasons for using this new motor? Contact your nearest G-E Apparatus Sales Office or write for bulletin GEA-5567. Address Section 700-121, General Electric Co., Schenectady 5, N. Y.

GENERAL ELECTRIC

SMALLER . . .





6. STURDY!—Another G-E innovation: shell is expansion-fitted to stator: a strong *unit* assembly.

7. LESS MAINTENANCE! Spacious oil reservoirs—no lubrication required on some applications.

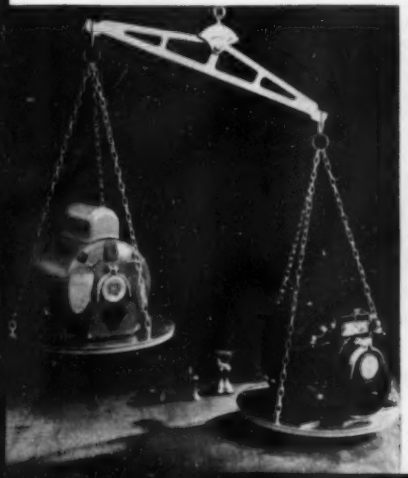
8. CONVENIENT!—Roomy terminal box—cover has connection and lubrication instructions.

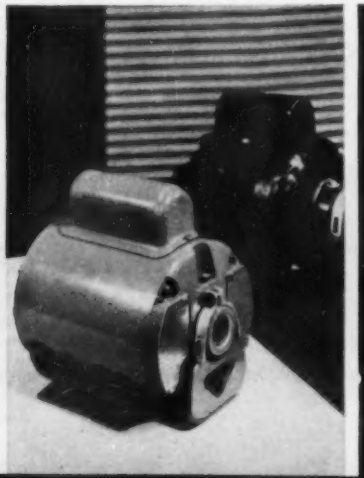
9. RIGID!—This motor has strong, lightweight aluminum end shields especially rib-reinforced.

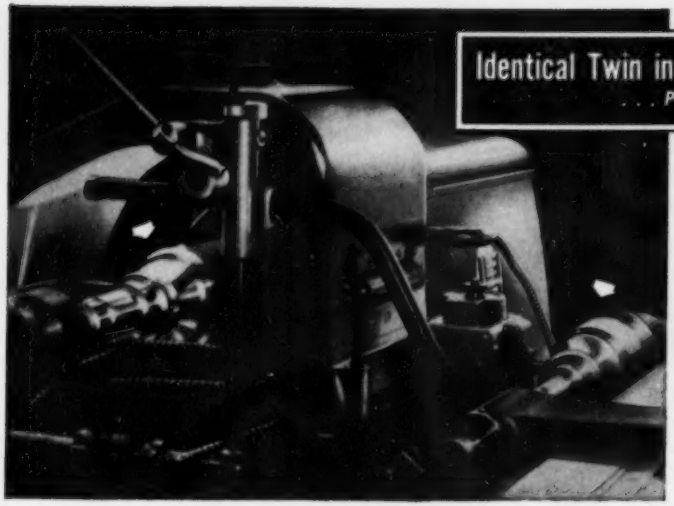
10. FLEXIBLE—Cradle bases—*solid* or resilient—facilitate easy mounting in any position.

the all-new G-E Fhp motor!

LIGHTER . . . ***BETTER LOOKING . . .*** ***MORE VERSATILE!***



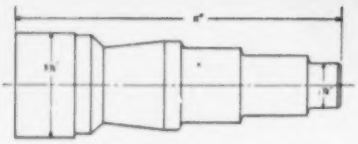


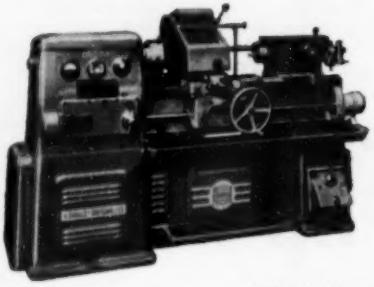


Identical Twin in Less than Four Minutes

. . . Produced on the

HIGH SPEED HYDRAULIC COPYING LATHE





Examine this miracle of modern engineering made possible by the H.E.B. High Speed Hydraulic Copying Lathe. Pictured at the right is the turned master; at the left you see its identical twin — a shaft of S.A.E. 4130 steel accurately copied in just 3¾ minutes. That's breath-taking speed for such precision finish.

The H.E.B.'s patented tracer device is built into this ruggedly constructed lathe. There are no troublesome attachments, and *setting time takes no more than 10 to 20 minutes.* Experience on production lines proves time and again that finished parts are copy-turned up to 300% faster than on multi-tool lathes!

With its 20 H.P. motor the **OP Model** takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. **GT Models** with rotating pattern are designed for copying an infinite variety of irregular, non-circular work.

More than 1000 of these modern copying lathes are now in use worldwide . . . designed and built in France by H. Ernault Batignolles, manufacturers of machine tools for almost a hundred years.

Catalogs on both of these machines, including complete specifications, are available upon request. Write or telephone now for catalog or demonstration.

TYPE 178 CONSTAN CARBIDE TOOL GRINDER

The Constan Grinder is specially designed for sharpening carbide tools, etc., without attachments . . . lengthens their life and improves cutting capacity. Heavily built, the Constan combines smooth operation and ease of setting with great rigidity. The inclinable table incorporates a ball and socket vise so that the tool may be clamped in any position. Two diamond wheels — one for roughing and one for finishing — are mounted on the wheel head, and each may easily be brought into position. The machine may also be used for sharpening milling cutters.

H·E·B

"THE WAY TO TURN"

IMMEDIATE DELIVERY

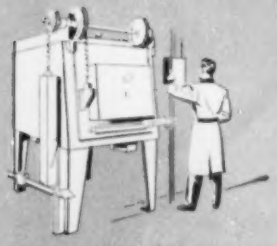
H. E. B. MACHINE TOOLS, INC.

475 FIFTH AVENUE, NEW YORK 17, N. Y.

Telephone: LExington 2-0266

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • TOOL ROOM LATHES • CARBIDE TOOL GRINDERS

for toolroom or high production... quality HEAT-TREATING calls for a WESTINGHOUSE FURNACE...



Typical Westinghouse Box Furnace used in toolroom heat-treating for hardening. Other Westinghouse Furnaces available for carburizing, drawing, ageing, annealing, austempering, brazing, carbonitriding, martempering, nitriding, preheating, sintering, solution treatment.

There's a Westinghouse furnace to provide the exact answer for every heat-treating application . . . gas or electric. For toolroom or for low-to-medium production applications, choose from over fifteen standard types of box furnaces, ten protective atmospheres. J-10373

SEND FOR FREE BOOK...

YOU CAN BE SURE... IF IT'S Westinghouse

HEAT-TREATING FURNACES

Westinghouse Electric Corporation,
Industrial Heating Department
Meadville, Pennsylvania

Please send me free booklet, "Westinghouse Furnaces for the Toolroom, Laboratory or Production Line"

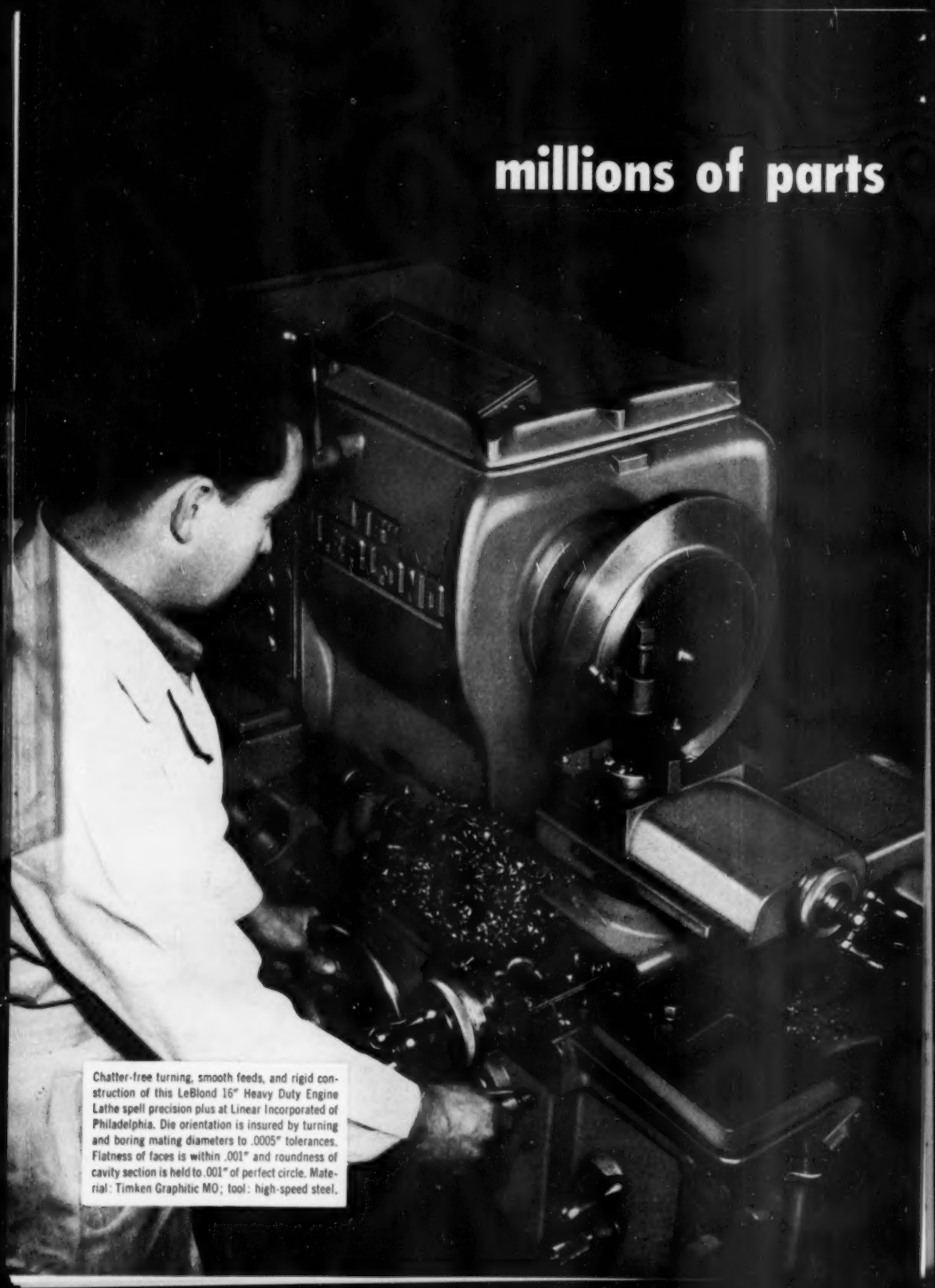
Name_____

Firm_____

Title_____

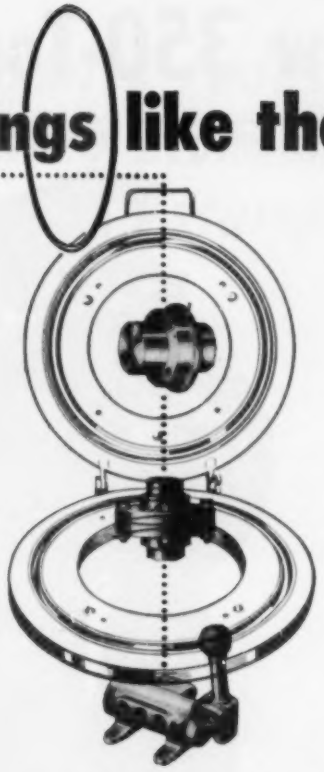
Address_____

millions of parts



Chatter-free turning, smooth feeds, and rigid construction of this LeBlond 16" Heavy Duty Engine Lathe spell precision plus at Linear Incorporated of Philadelphia. Die orientation is insured by turning and boring mating diameters to .0005" tolerances. Flatness of faces is within .001" and roundness of cavity section is held to .001" of perfect circle. Material: Timken Graphitic MO; tool: high-speed steel.

are married with rings like these



Industry needs sealing rings to "marry" millions of parts against leakage of air, liquid, and gas. Seals, for example, like the rubber "O" rings made by Linear Incorporated of Philadelphia. They're vital to the successful operation of hydraulic mechanisms, air-operated devices, and chemical processing equipment . . . to name just a few applications. And industry says, "Make these sealing rings to precision tolerance for non-leakage. Deliver the millions we need at low cost."

Linear experimented . . . found that "O" rings with the required finish and roundness could be mass-produced easily enough . . . but to turn them out at low cost demanded virtual elimination of hand-finishing operations. The problem called for dies made to tolerances that would deliver cross-sectional roundness conforming to nearly "perfect circle," mating diameters so accurate that perfect die orientation could be achieved.

Then Linear installed their new 16″ LeBlond Heavy Duty Engine Lathe. This profit-building lathe is saving expensive toolroom time and delivering cavity finish on Linear's dies as fine as 10 microinches, mating diameters to the required .0005″ whisker of tolerance, cross sectional roundness within .001″ of perfect circle. Costly die-finishing time at Linear is down . . . flash-removing second operations on "O" rings are at a bone-bare profit-making minimum. It's a case of chatter-free turning, smooth-as-silk feeds, and rigid construction.

LeBlond features like hardened and ground self-compensating steel bed ways, totally enclosed quick-change box, one-piece apron and a host of others will insure Linear a lifetime of this same smooth-turning performance.

Whether you need unfaltering accuracy or high output rapid production, there's a LeBlond lathe that will fill the bill. Your nearby LeBlond distributor will tell you about our complete line. Call him or write

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

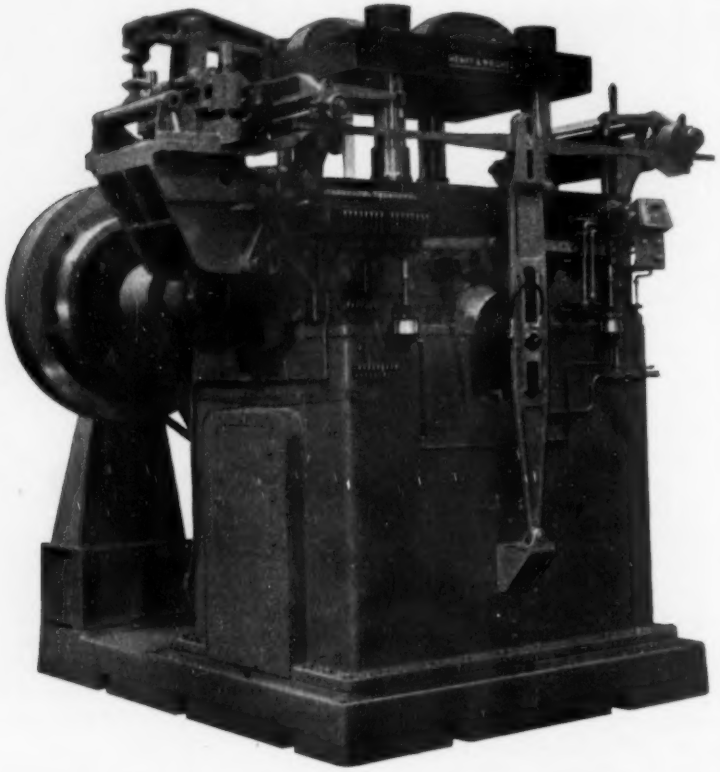
Ask for Bulletin HD125A
for more information on the 16″
LeBlond Heavy Duty Engine Lathe

turned faster by

LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 64 YEARS*

New 350-Ton Henry & Wright



Right and left hand sections of housing for automotive window control gears. Replaced zinc casting. Produced from .065" thick hot rolled steel in coil form at rate of 60 completed pairs per minute. Steps performed with each stroke of machine: notch, pierce for pilots, draw, re-draw, strike and lance, lance for partial blank outline and pierce holes for shaft, bend ears at 90°, pierce and bend ears at 45°, close ears and form welding tabs, lance for partial outline, bend ears 90°, final forming, cut off one complete right hand and one left hand housing section.

OTHER EMHART PRODUCTS INCLUDE:

PREMIUM QUALITY STAMPING PRESSES

THE V & O PRESS CO.

Division of Emhart Mfg. Co.

HUDSON, NEW YORK

GLASS MAKING MACHINES

HARTFORD-EMPIRE CO.

Division of Emhart Mfg. Co.

HARTFORD 2, CONNECTICUT

AUTOMATIC PACKAGING EQUIPMENT

STANDARD-KNAPP

Division of Emhart Mfg. Co.

PORTLAND, CONNECTICUT

PLASTIC BOTTLES, BOOS, TUBES, SPECIAL SHAPES

PLAX CORPORATION

Subsidiary of Emhart Mfg. Co.

HARTFORD 1, CONNECTICUT

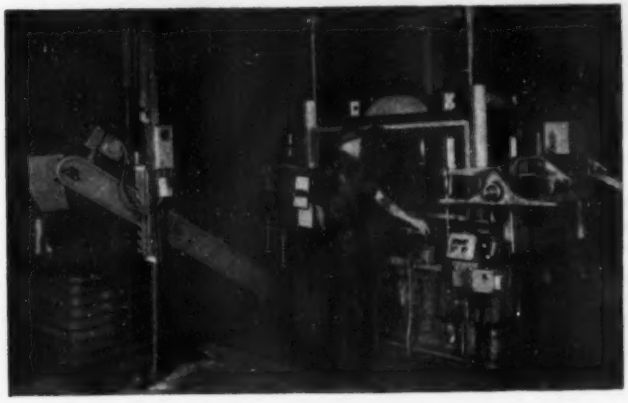
Dieing Machine *permits redesign of die-cast parts for more economical production via progressive stamping*

This newest addition to the Henry & Wright line of Dieing Machines broadens significantly the range of parts which can be produced complete-per-stroke with multiple-station progressive dies. It will produce completed drawn and formed stampings from medium and heavy-gauge sheet stock.

Up to 16" strokes can be provided for producing straight shells up to 3⅞" long and tapered or hemispherical shells of substantially greater lengths.

The lower crosshead is guided on exceptionally long ways, rigidly keyed in the lower base to provide precision alignment of tools throughout the stroke, even under severely eccentric loading.

Maximum tool protection is designed and built into the 350-ton Dieing Machine, which will handle material up to 25" wide and 11/32" thick. The same great features of other Dieing Machines are present, on enlarged scale, in this 350-ton beauty.



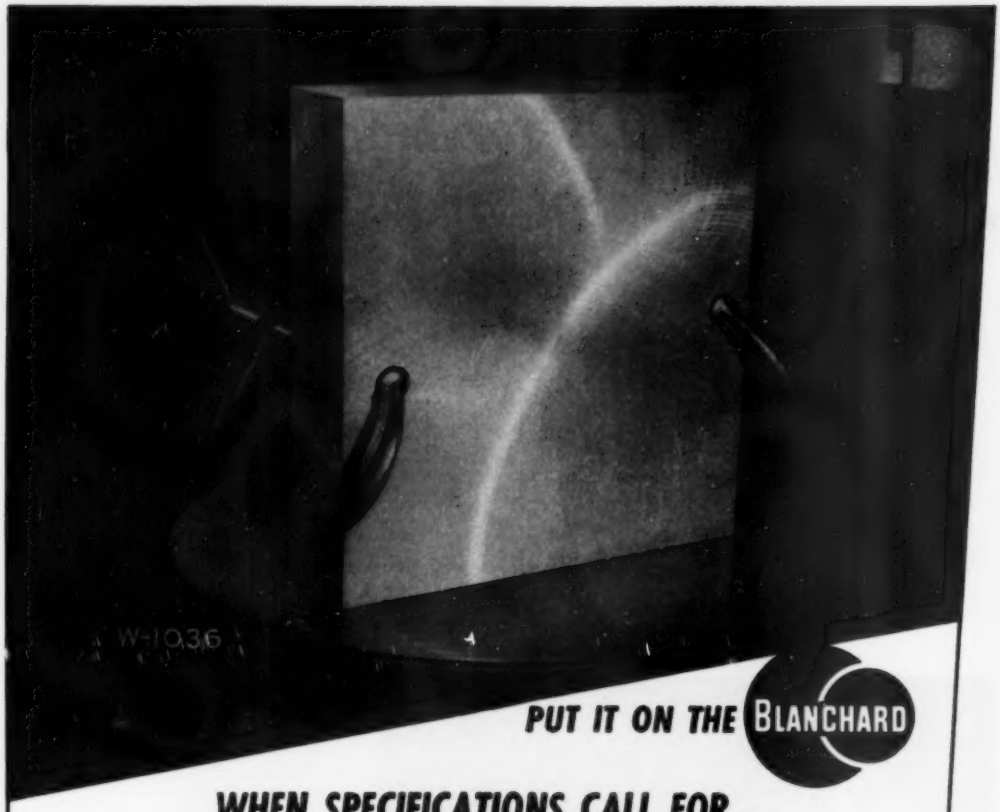
SAVINGS IN MANPOWER and production operations are manifest in this installation of the 350-ton Dieing Machine. One man attends the press, which automatically stamps complete parts out of sheet metal. Compare the economies of producing pieces complete-per-stroke at high speed via the Dieing Machine with the previous method of using zinc die castings.

Only the best is good enough

FACT PACKED CATALOG

Complete descriptions of all Henry & Wright Dieing Machines. Write: Henry & Wright, 481 Windsor St Hartford 5, Connecticut.

HENRY & WRIGHT
Division of Embart Mfg. Co.



PUT IT ON THE BLANCHARD

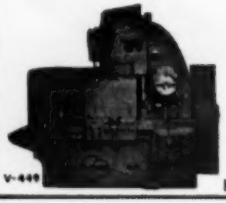
WHEN SPECIFICATIONS CALL FOR...

HEAVY STOCK REMOVAL — This steel block was torch-cut from a plate. It is 24 inches square and 6 inches thick. ¼" of stock was removed from the broad surfaces, and ¼" from the 4 edges — a total of over 100 lbs.!

SPEED — A No. 18 Blanchard Surface Grinder, with extended column, ground this block on all 6 sides in only 6 hours.

ECONOMY — Not only did speed of stock removal roll up real savings, but the abrasive cost for the Blanchard Grinding Wheel, which was used for the job, figured less than 6 dollars.

CLOSE TOLERANCES — The block was held square in all directions to .002". Although this particular job calls for heavy stock removal, this same No. 18 Blanchard is fully capable of grinding to a dimension tolerance of ±.0001", a surface finish of 3 micro-inches, and flat within 3 light bands!



NO. 18 BLANCHARD SURFACE GRINDER

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE CO.

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

BULLARD

MANUFACTURERS OF MACHINE TOOLS

"Park La Brea", Metropolitan Insurance Company housing project — Los Angeles, California

Los Angeles Times Photo

The Invisible Background of Industrial Progress

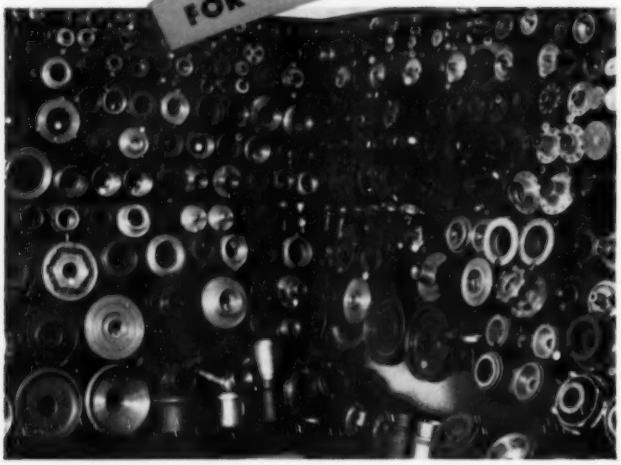
American Initiative — American Free Enterprise — state and municipal planning, through new and modern housing developments are raising the standards of the American Way of Life for a large part of our one-hundred-and-sixty-million population. Illustrated here is "Park La Brea", a Metropolitan Insurance Company housing project in Los Angeles, California. This is typical of today's Modern City planning, incorporating up-to-the-minute home facilities including auto parking and recreational park areas.

These projects encompass many phases and many industries for the production of construction equipment, materials, inbuilt equipment such as elevators, heating and air conditioning units and the wide variety of household appliances. In The Invisible Background of Industrial Progress are the builders of * *Modern Machine Tools* who provide basic manufacturing equipment to the infinite numbers of industries required to complete these huge developments. Bullard plays a singular part in American Progress and is proud of its contribution to the American Way of Life.

THE BULLARD COMPANY
BRIDGEPORT 2
CONNECTICUT

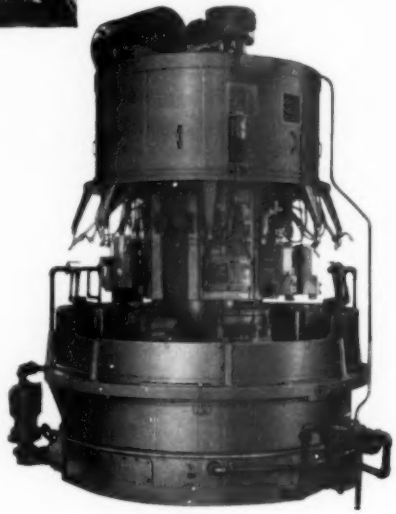
* For greater manufacturing economy REFER to next page

BULLARD MACHINE TOOLS
FOR GREATER MANUFACTURING ECONOMY



From the time of the inception of the Mult-Au-Matic back in 1914 these machines in customers' plants have probably machined the largest variety of work of any machine tool. Illustrated herewith are only a few of many hundreds of Mult-Au-Matic jobs. The machine's versatility suits it for nearly any type and shape of work where the operations call for boring, turning, facing, drilling, reaming and threading.

Motor manufacturing which includes pleasure cars, trucks, tractors, mechanical farm equipment and airplane engines is the largest user of these automatic multiple spindle machines. However other manufacturers contributing to the mining, shipbuilding, hydro-electric, ore, railroading, oil, bridge construction industries, scientific developments and modern housing projects have found the economy of Mult-Au-Matic production a large factor in the marketing of their products. Wherever automatic multiple spindle manufacturing can be efficiently used there is a place for Mult-Au-Matics with their attendant savings in manufacturing costs. Bullard engineers are ready to assist in applying Mult-Au-Matic efficiency to your particular manufacturing problems. Let us make a study of your production methods.



For Manufacturing Economy use Mult-Au-Matics. Built in 8-, 12-, 16-, and 34-inch sizes with 4, 6, 8, 12, or 16 spindles according to the specific model.

BULLARD

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

DANLY

is faster!

... for Piercing

for Punch Extruding...

... for Trimming

for Riveting...

You can pierce, trim, extrude or rivet at less cost because you can do it faster with Danly Hydraulic Metalworking Equipment! Check these new cost and time saving advantages:

• ***Greater Capacity*** . . . the exclusive Danly hydraulic system minimizes break-through shock and permits smoother operation at higher pressures. You can pierce holes smaller in diameter than the thickness of your steel!

• ***Automatic Stripping Action*** . . . set-up and operation are greatly simplified because blank-holding and stripping action is an integral part of the Danly power cylinder cycle . . . completely hydraulic.

• ***Less Down Time*** . . . hardened and ground wear surfaces and extra long guides assure maximum tool life. Springs and rubber cushions, a major cause of failure, are eliminated.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY

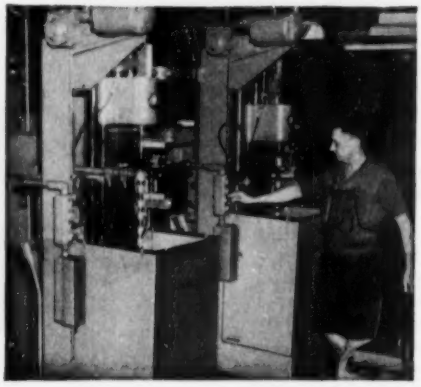
HYDRAULIC METALWORKING EQUIPMENT
MECHANICAL PRESSES... 50 TO 3000 TONS

Application possibilities are almost unlimited because Danly Hydraulic Metalworking Equipment is engineered to meet your specific needs. Write today for complete information.

WHICH OF THESE HEAT-TREATING PROBLEMS IS YOURS?

Cost Reduction?
Increased Production Rates?
Quality Control?
Reducing Distortion?
Production-Line Heating?
Floor Space?

Westinghouse induction heating helped Saco-Lowell solve all six



Saco-Lowell Shops, makers of outstanding textile machinery, had always experienced problems with hardened bottom front rolls.

A Westinghouse 50 KW-450 KC RF Generator, with two standard vertical scanners, helped increase line production rates by 145% with total annual savings of $18,800.00. Direct labor costs have been cut 63%. Journal bearings are now ground after hardening, producing a higher quality roll. Formerly, every shaft required straightening; now this operation has been simplified and costs are reduced 70%.

Look at the results obtained by Saco-Lowell with a Westinghouse process that can handle 432 different rolls. Examine your heat treating problems. They, too, may be reduced, clarified, or eliminated entirely.

J-02343

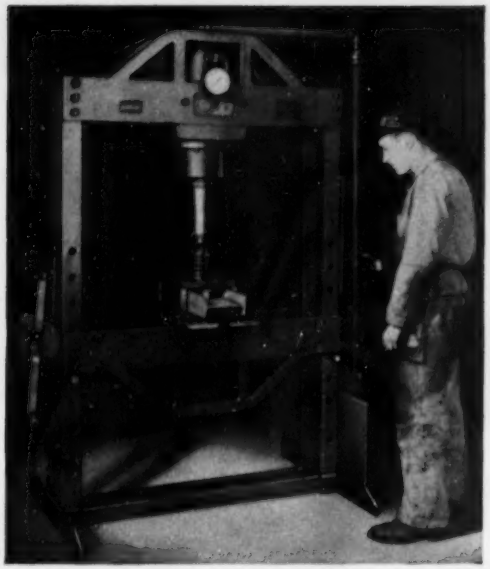
Westinghouse Electric Corporation
Department M-43
2519 Wilkens Avenue • Baltimore 3, Maryland

Send me your informative case history booklet on induction heating.

Name .....
Company .....
Street .....
City ..... Zone ..... State .....

YOU CAN BE SURE...IF IT'S
Westinghouse
INDUCTION HEATING

Greater
Productivity
AUTOMATIC BAR AND CHUCKING MACHINES · PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING DRILLING AND MILLING MACHINES
NEW BRITAIN
Automatics
THE NEW BRITAIN-GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT



KRW HYDRAULIC PRESS DOES 4 VITAL JOBS ON POLE-SETTING DERRICKS

BATAVIA METAL CORP. bought a K. R. Wilson 75 ton motor-driven Hydraulic Press two years ago to perform a few routine operations on their pole-setting derricks (derrick shown on telephone truck below). But they soon found that the amazing versatility of the press—the ease and speed with which it can be converted from one set-up to another, makes it a natural for all kinds of trouble shooting. Below are just a few of the jobs their KRW press does.

1. SETTING RIVETS in side legs and front braces of pole-setting derricks. Thanks to their KRW press, Batavia Metal has eliminated loosening of rivets and the resulting loss of valuable production time.

2. COSTS CUT 33⅓% The center hole on derrick foot plates must be 1½" in diameter, flanked by two 11/16" holes. Originally the company drilled three 11/16" holes on a small drill press, then moved the plates to the machine shop where the center eye-bolt hole was reamed out to 1½" diameter. Use of a simple die plus the KRW press produces all three holes in one stroke and eliminates the drilling and reaming operations, cutting costs by more than ⅓.

3. FORMING BRACKET U'S for derrick mountings on front of trucks and riveting the lower sections of front mountings are two more jobs done quickly, accurately and efficiently on the KRW Hydraulic Press.

4. FORMING BASES for rachet jacks and restoring proper contour to various castings which sometimes warp as they cool are also regular assignments for this KRW press. Company officials tell us that their KRW Hydraulic press is in use the greater part of every working day!

Any pressing problems in your plant? Check with K. R. Wilson for the right press to do the job. KRW Hydraulic Presses come in one, two and three cylinder models; 25 to 150 ton capacities; hand operated, air operated or motor driven. For facts and prices contact your machinery dealer or write, wire or phone Dep't. 11.

***IMMEDIATE DELIVERY** on type of press shown above up to 75 ton capacity, hand, air or motor driven.*

K. R. WILSON

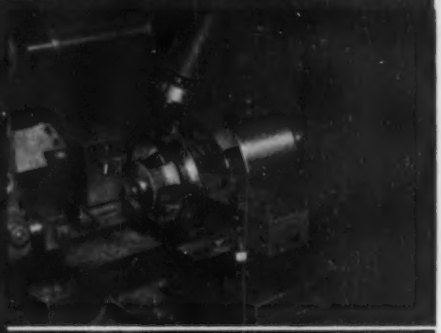
215 MAIN STREET · BUFFALO 3, N. Y.

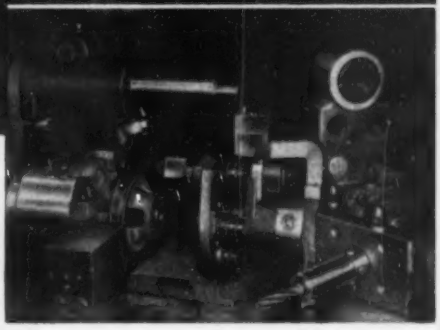
DESIGNERS AND BUILDERS OF HYDRAULIC PRESSES TO SOLVE ANY METALWORKING PROBLEMS

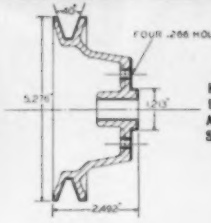
POTTER & JOHNSTON TOOLING

14 OPERATIONS with ONE SETTING

P&J 3U SPEED-FLEX







HEAVY LINES INDICATE MACHINED SURFACES.

Difficult chucking jobs — like finishing the cast iron pulley shown above — are done easily, rapidly and economically with expertly engineered Potter & Johnston Tooling on a P&J 3U Speed-Flex. Full power and high spindle speeds allow fast metal removal with carbide cutting tools. The pulley groove is finish machined by two single-point slide tools — thus eliminating any distortion that might result from a broad face cut. As the last step, the four .266" holes are accurately located and drilled by a special, 4-spindle drill head that is automatically positioned and locked at the completion of the preceding operation. With this ingenious, time-saving set-up, all operations are performed automatically; one operator can easily handle several machines, and your labor costs are divided.

If your manufacturing operation requires the rapid production of small, precision parts, it will pay you to learn more about Potter & Johnston Tooling and the P&J 3U Speed-Flex Automatic Turret Lathe. See how this combination can help you increase output, improve work quality and reduce unit costs.

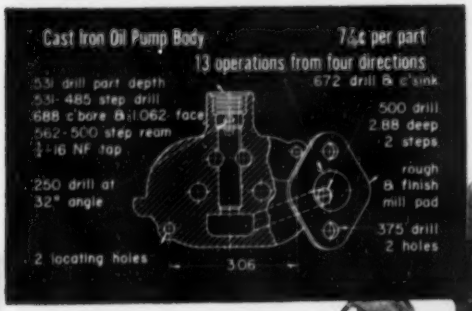
Send in sample parts or prints for tooling recommendations and time estimates — and send today for your copy of fully illustrated P&J Bulletin 145.

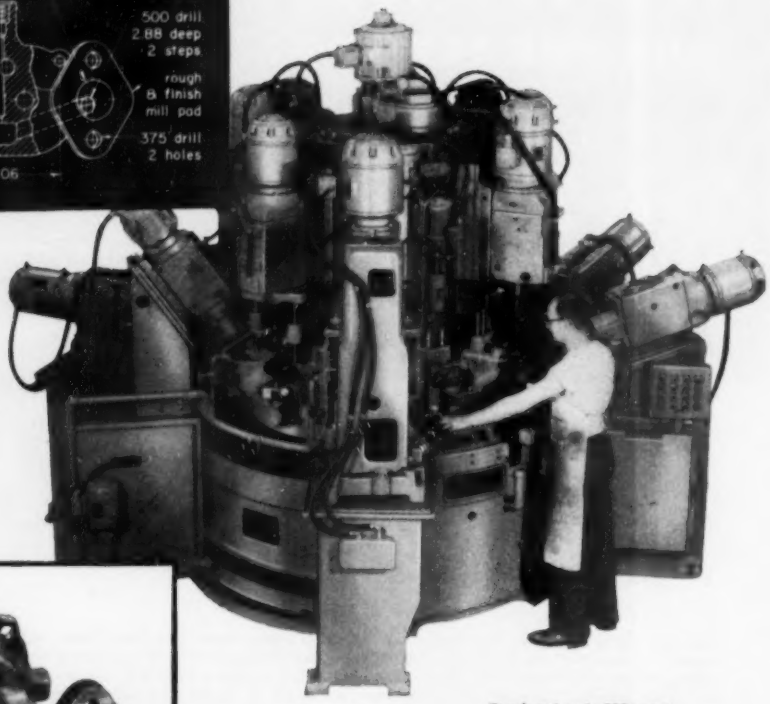
POTTER & JOHNSTON COMPANY

PAWTUCKET, RHODE ISLAND

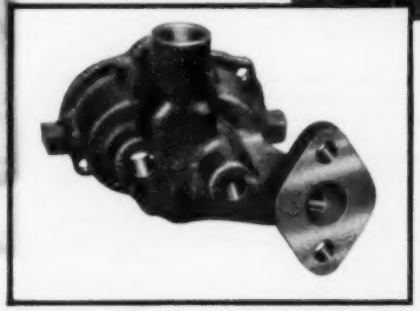
SUBSIDIARY OF PRATT & WHITNEY — DIVISION NILES – BEMENT – POND CO.

More parts per man-hour soon





13 Operations from 4 Directions 7 7/10¢ per part



Production is 200 parts per hour gross.

KINGSBURY Special Purpose Drilling and Tapping Machine Combines Operations to Save Money

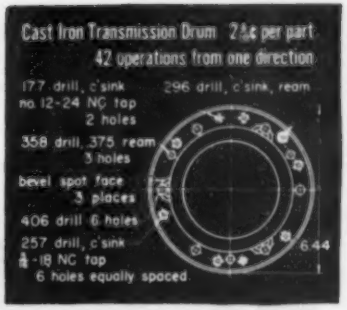
Dear Sir:

Look at this Cast Iron Oil Pump Body. How many machines would *you* need to do all this work? One central column Kingsbury with an 84-inch base and 60-inch index table does all 13 operations. It has ten stations with 11 drilling units and one tapping unit. One unit has a two-spindle auxiliary head. Six units are mounted vertically. The other six units are mounted on knees bolted to the base and these are mounted at three different angles to the work.

The longest single operation governs the time required to finish one piece. By splitting a long operation into two short ones, using two units, the time cycle can be cut. Thus the .500 hole is drilled in two steps.

Bushing carriers guide all tools except the tap, the milling cutters and the second .500 drill. This means accurate alignment and precise positioning from the locating point. An interesting operation is the finish milling operation which has a special mechanism that draws the cutter away from the work on the up stroke. No tool marks to mar the finish.

pay for a KINGSBURY



Designed to Produce One Part

Kingsbury Machines are designed for low production costs on long runs of parts requiring several operations. The more operations at one setup, the greater are the savings possible. But these machines pay for themselves on simple work too. For example, the Steel Bearing Race shown at the lower left requires only a few operations. The Kingsbury machine soon paid for itself with more parts per man-hour at greater accuracy.

Each machine is equipped with ½ to 5 hp automatic units. The number of units and the type of work holders depend on the work to be done. The work table may be stationary or it may be indexed. Your Kingsbury will come to you ready to run.

How Unit Costs were Figured

Each unit cost shown is the sum of these two figures —

The unit cost of the man:

$$\frac{\text{average U. S. hourly rate}}{\text{hourly gross} \times 80\% \text{ efficiency}}$$

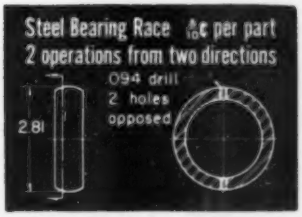
The unit cost of the machine:

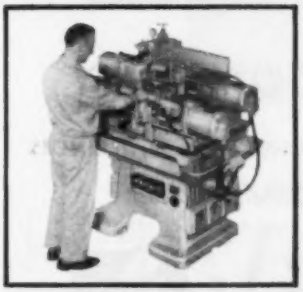
$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% efficiency}}$$

The costs include just the man and the machine — no power or overhead. As to the 6000 hours, that's about three years for one shift — one year for three shifts.

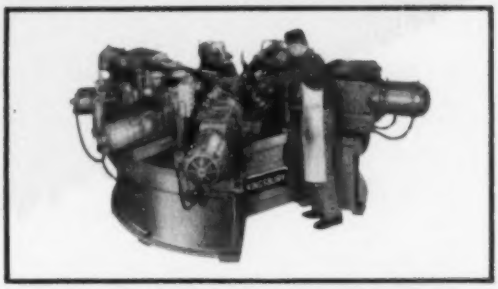
If you want more information just drop us a line.

Sincerely,
Kingsbury Machine Tool Corp.
99 Laurel St., Keene, N. H.





Production is 680 parts per hour gross.



Production is 330 parts per hour gross.

⊤ Cast Iron Transmission Drum

42 Operations 2⁶/₁₀¢ per part

Note the number of operations. (42 spindles are required, all working at once.) This Kingsbury machine has a 100-inch base and 30-inch index table. There are seven drilling units and one tapping unit. All are mounted horizontally and use auxiliary heads with from three to nine spindles each. Bushing carriers guide all tools but the taps. Each fixture is automatically unclamped as it indexes to the unloading station.

⊢— Steel Bearing Race

2 Operations—from 2 Directions ⁶/₁₀¢ per part

The machine on the left looks simple, doesn't it? It is, but it really produces. The operator of this double end machine puts in one piece and trips a lever. Air cylinders clamp the work and opposed units drill .094. While they are operating he loads another part into the rear fixture. With two fixtures, the operator can load one while the other is working — no waiting for operations to be completed. There's no indexing, just a 46 by 24 inch rectangular table.

KINGSBURY

AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

"MARVEL" HAS
always had the edge

MARVEL High-Speed-Edge Blades assure Faster, more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back, with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production and lower cost per cut, comes the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—*they will not shatter.*

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary blades.

1. High-Speed-Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1. & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is *positively unbreakable.*

ARMSTRONG-BLUM MFG. COMPANY

"THE HACK SAW PEOPLE"

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

AUTOMATICITY BACKS UP HIGH VELOCITY TURNING ON FAY AUTOMATICS

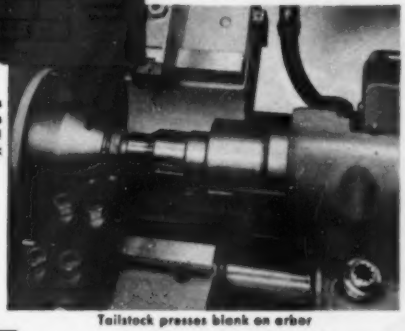
SIDE GEARS
18 Seconds Floor to Floor — 635 SFM

Two 8" Fays, with Automatic Sequential Control, machine all exterior surfaces of the blanks in two operations; one machine for each. The major diameter is 2-15/16" and floor to floor time is approximately 18 seconds in each operation.

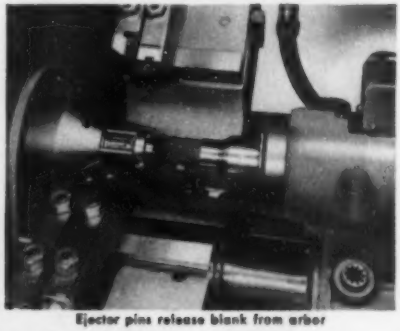
Automatic Cycle—The machines are equipped with automatically operated splash guards and automatically air-operated tailstock rams for pressing the blank onto a splined arbor equipped with automatically operated ejector pins.

The operator places the blank on the end of the arbor, and pushes the cycle start button. *Automatically, the guard closes, the tailstock ram presses the piece onto the arbor and then retracts. The carriage turns, the back arm faces, and at the end of the cuts, ejector pins push the piece onto the loading section of the arbor* from which it is removed manually.

FIRST OPERATION: Note intricate movements of the carriage, which turns the hub, back angle and major diameter. The back arm faces and forms.



Tailstock presses blank on arbor



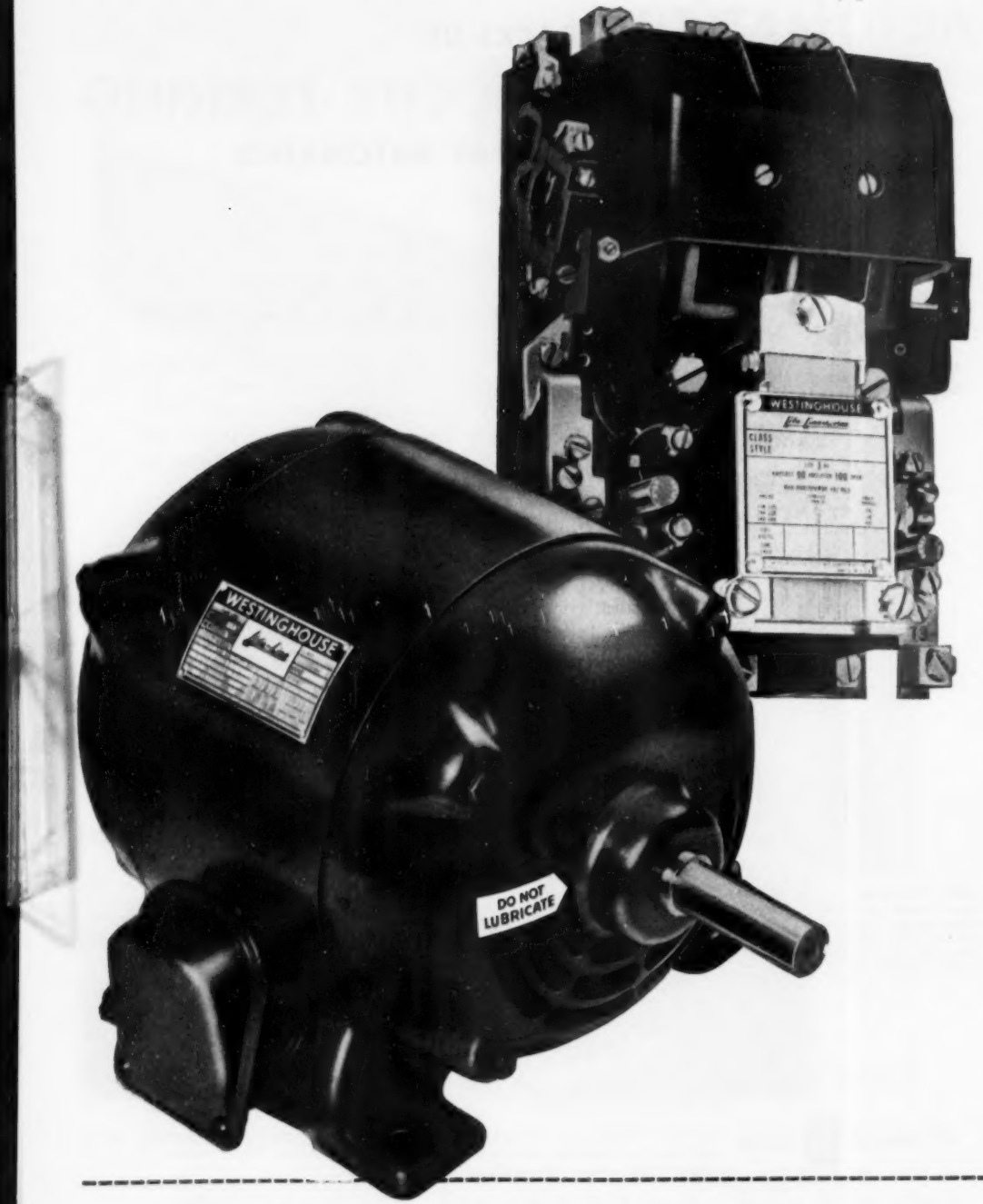
Ejector pins release blank from arbor

Production management regularly relies upon the engineering services of Jones & Lamson for the latest information on methods, costs, tooling and performance. Why not consult us about YOUR *turning, threading and inspection problems.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. Dept. 710 — **FAY LATHE DIVISION**



WHAT *Life-Lines* REALLY DELIVER IS MORE SERVICE...LESS SERVICING

See the space you save with these modern *Life-Lines*

Both Life-Line motor and Life-Linestarter are space stretchers. The reason? Compactness. They are smaller, lighter than most conventional types . . . can be installed in close quarters where others can't be accommodated.

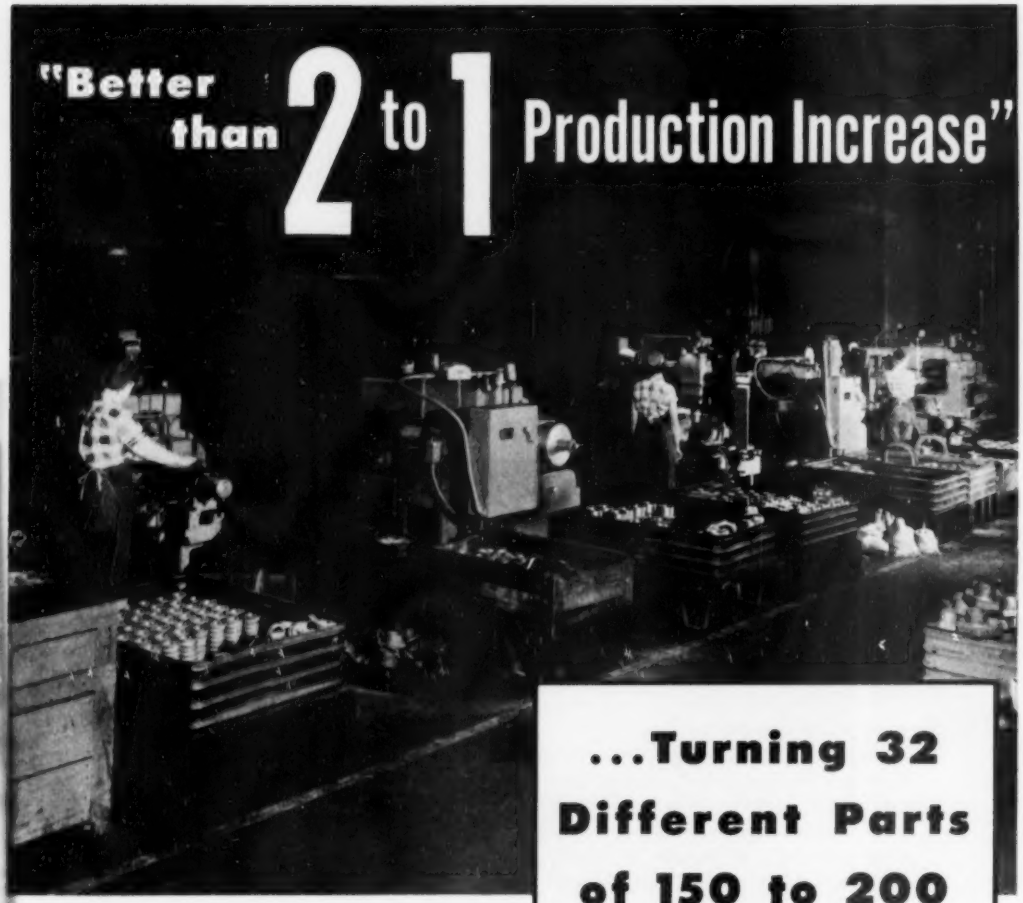
Notice that the motor has no grease cups or fittings. It's pre-lubricated . . . needs no further lubrication. This means you can cramp it into close quarters, forget greasing channels and nipples brought to outside of machine. Just install it in "hard-to-get-at" locations and forget it! The way to grease a modern motor is *don't.*

A check of the Life-Linestarter will show you all parts can be removed straight from the front. No need to allow extra work room for servicing. Further, wiring is straight through. You get simplified wiring, shorter leads. And you can have two electrical interlocks without increasing starter width. This means, smaller cavities and more compact cabinets.

These features give you the most advanced designed equipment available today. Built to match the modern advancements you build into your equipment. But get complete data. Ask your Westinghouse representative for latest information, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21692

YOU CAN BE SURE...IF IT'S
Westinghouse
Life-Line
MOTORS and CONTROLS

"Better than 2 to 1 Production Increase"



...Turning 32 Different Parts of 150 to 200 Lot Sizes

This modern turning battery includes two Model 4A, four Model 8A and one Model 12A Sundstrand Automatic Lathes. Thirty-two different parts of cast iron and steel are turned in lot sizes varying from 150 to 200 pieces per lot. Production increase is as high as from 40 to 150 parts per hour compared to former method.

One Operator Handles 2 Machines

Because of the ease and simplicity of operating Sundstrand Automatic Lathes, one operator is able to handle 2 machines. If you have turning problems consult a Sundstrand Methods engineer. There is no obligation for this service.

SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Each of these Sundstrand Lathes has these Modern Production Features

Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Speeds

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Feeds

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Carriage Adjustments

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Simple, Fast Set-up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-clutching

All new models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

4 MODELS COVER HP RANGE OF 3 TO 75 HP.

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 7½ HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 60 to 1800 RPM	30 to 900 RPM 40 to 1200 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5" 8¼" 275"	 6" 12½" 250"	 8" 15¼" 250"	 12" 17" 250"
REAR SLIDE: Max. Stroke	4"	5½"	6½"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60".	24, 36, 48 & 60"	36, 60 & 84"

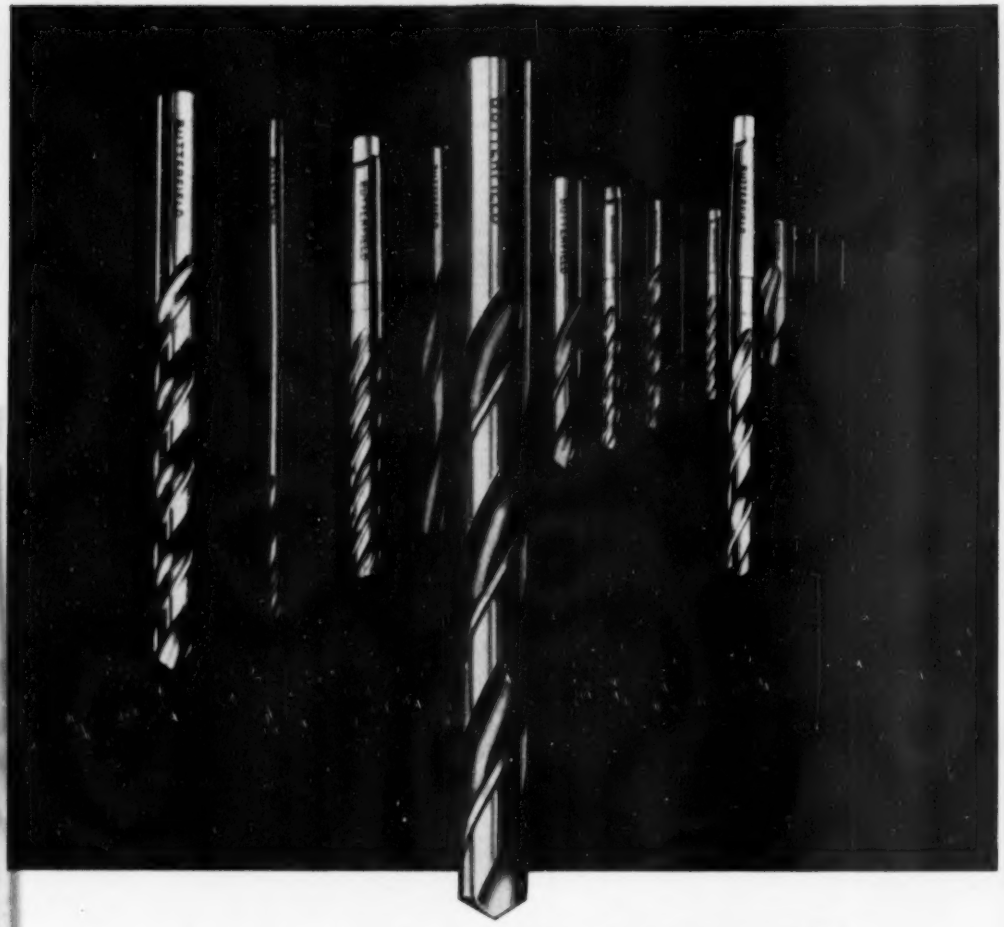
Additional Data . . .

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for bulletin 125

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



NEW RECRUITS...100% INSPECTED

...JOIN THE BUTTERFIELD DIVISION!

Butterfield Twist Drills Are Here — For Every Purpose. The Latest Additions To This Famous Line.

Now you can get twist drills of the same high quality as the Butterfield taps, dies and reamers that have served you so well over the years. As with all Butterfield products, each drill is individually inspected for accuracy and quality — 100% inspection for 100% satisfaction. Union Twist Drill Company, Butterfield Division, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.

BUTTERFIELD

THE 100% INSPECTED TOOLS

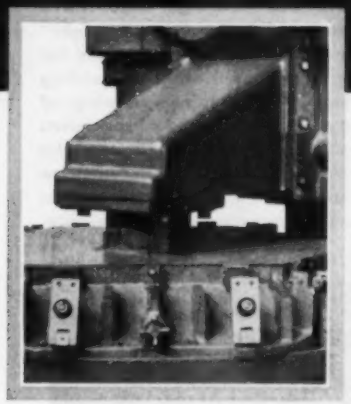
Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES • TWIST DRILLS

Bar stock being tested for microstructure . . . one step in Butterfield's 100% inspection.

SEE YOUR NEARBY BUTTERFIELD DISTRIBUTOR FOR PROMPT DELIVERIES AND SERVICE

NEWTON VERTICAL SPINDLE ROTARY CONTINUOUS MILLING MACHINES



CENTER SUPPORT
Furnished when required

DESIGNED FOR HEAVY MILLING WITH CARBIDE CUTTERS

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

This representative example of Newton high production milling machines has the advanced features required for heavy precision milling with carbide cutters and motors up to 50 H.P. An unusually rugged frame provides the rigidity necessary to such operation. On long work pieces such as automobile and tractor cylinder heads, 36" between spindles makes possible the completion of the roughing cut before the finishing cut starts. Independent pick-off gears for each spindle provide the means for correct cutting speeds for both roughing and finishing cuts. Heavy flywheels, solidly attached to each spindle, insure maximum cutter life between grinds. Intermittent feed—rapid traverse attachment and center support are optional. Two standard table sizes. Other table sizes and spindle center distances are available. Newton Milling Machines, applicable to your precision milling problems, will help to step up your production and reduce your costs. Complete information will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

Specialists IN "Specials"

"Specials" are ball bearings which have been custom designed to be "exactly right" for a particular application. Thus, the field for specials ranges from modification of existing standard bearings to complete new bearings of unusual shapes and dimensions. As "specialists in specials," experienced NICE engineers take advantage of every design opportunity to reduce costs without sacrifice of quality and to improve product performance and appearance.

SPECIAL BEARINGS

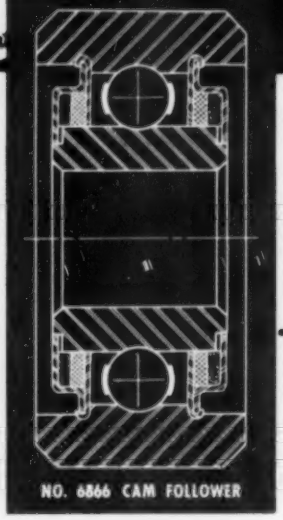
of unusual shapes and dimensions

Where new tooling is justified by the quantities involved, specials of this type, where applicable, offer the greatest possibilities for cost savings and product improvement. A few typical application examples are illustrated.

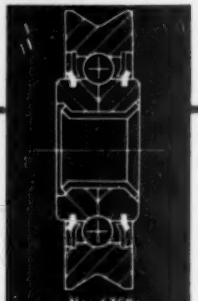
Representative of Nice ingenuity is No. 6866, a cam follower on an agricultural harvester. No. 6866 replaces a precision bearing pressed into a specially machined outer tire . . . and the resulting improvements were:

1. **LOWER COST (OVER 30% SAVINGS).**
2. **INCREASED CAPACITY.**
3. **MORE EFFECTIVE SEAL.**
4. **PACKAGED INTERCHANGEABLE UNIT.**
5. **IMPROVED APPEARANCE AND PERFORMANCE.**

Characteristic of agricultural machinery, severe dust and dirt problems dictated the need of an efficient and rugged seal. No. 6866 seal has proved to be highly effective and durable.



NO. 6866 CAM FOLLOWER



No. 6750 BALING MACHINE WIRE GUIDE

SEMI-PRECISION "SPECIALS"

No. 6757 PRESSURE BEARING FOR LOCATING INSTRUMENT RECORDING CHART

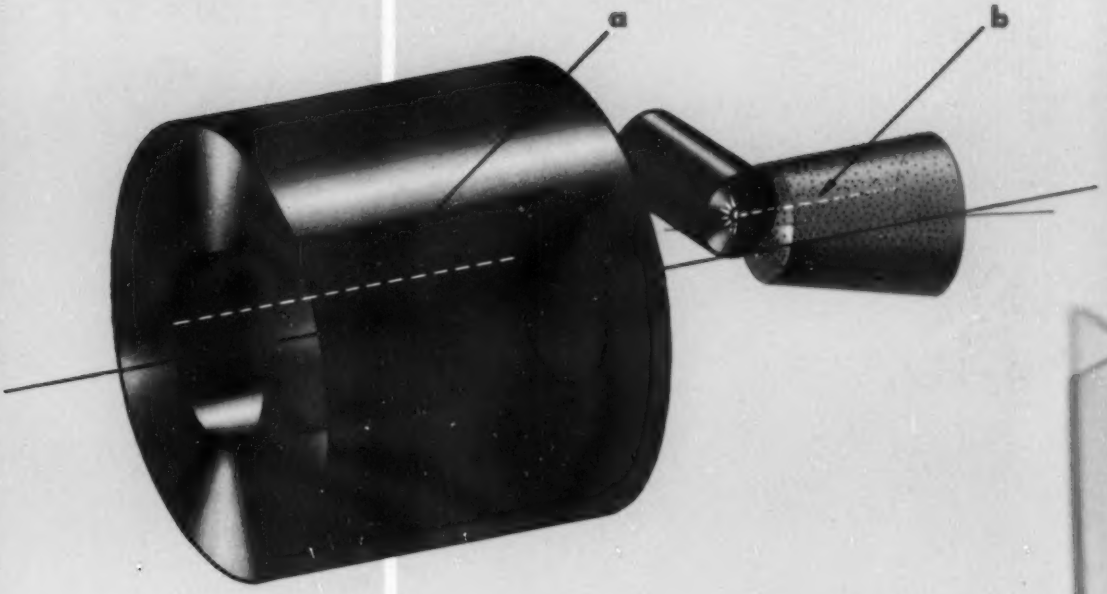
Many precision bearing applications do not require all of the elements of precision that are normally incorporated in a standard precision unit. For example, if the bearing cone is locked against a step on the shaft, grinding of the bore can be eliminated and will save approximately 10% of the selling price of a 2" OD precision annular bearing. Similarly, if the loads are not severe nor the RPM excessive, polishing of the ball grooves may not be necessary and will reduce the cost about 10%. In a light load application, the outer ring material can be changed to a less expensive steel at a savings of as much as 8% of the selling price.

THE USE OF SEMI-PRECISION BEARINGS, WHERE INDICATED, MAY REFLECT SUBSTANTIAL SAVINGS TO THE MANUFACTURER WHO BUYS BEARINGS IN PRODUCTION QUANTITIES.

NICE

NICE BALL BEARING COMPANY

NICETOWN · PHILADELPHIA · PENNSYLVANIA



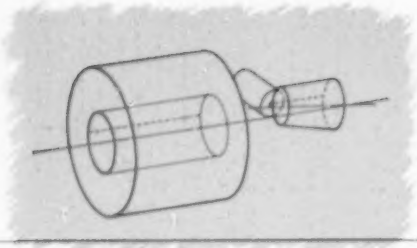
bryant
internal grinding

GRINDING a straight hole on an internal grinder is normally done with a straight (cylindrical) wheel. It is sometimes desirable to turn the wheelhead and dress the wheel to a taper in order to use a more rigid projection. However, this setup presents some serious obstacles which cannot be overcome unless they are clearly understood. In order to grind a straight hole the various elements of the machine must be in perfect alignment. The degree of alignment will be determined by the accuracy required on the finished part. A machine may be lined up sufficiently to produce holes within tolerance when grinding with a straight wheel, but if the wheel is turned and dressed to a taper, the alignment problem is magnified to such an extent that it may be impossible to produce holes within the same tolerance.

The center lines of the wheel, work and diamond must be in a common plane so that the wheel contacts the work at line "a". If the tapered wheel contacts the work above or below line "a" the wheel will touch only at its largest diameter and, as the wheel reverses (at the left end of the hole), it will transfer its taper to the work resulting in a tight hole at the back. Turning the workhead or changing the length of traverse cannot overcome this error. Further, because of poor contact, wheel wear will be excessive and finish poor.

If the diamond is set either above or below line "b" (which is a continuation of "a") the wheel will be dressed to a curve (hyperbola) and even if the wheel contacts the work at line "a" it will be only a point contact. Again, the wheel form will be transferred to the work at the point of reversal, wheel wear will be excessive and finish poor. The proper setup calls for perfection in setting the center height of wheel and work to zero and setting the diamond on dead center of the wheel.

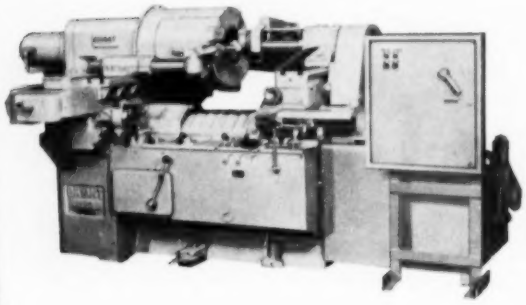
Bryant Chucking Grinder Co. Springfield, Vermont



bryant
internal grinding

Accurate alignment of various machine elements is a basic consideration on even the simplest machine tool. Industry's demand for increased production and accuracy makes the alignment problem more critical than ever before. Bryant machines are designed so that they may be aligned, and this alignment may be maintained throughout the life of the grinder. Alignment and its effect on precision hole grinding is discussed on the preceding page.

The Bryant 1126 Precision Hole Grinder



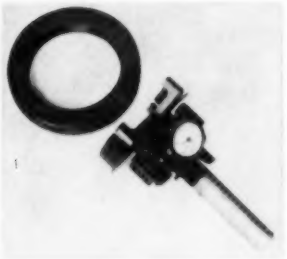
THIS heavy-duty, semiautomatic machine, with hydraulic controls, has 26" swing and will grind holes with a maximum depth of 12". Although designed for large, heavy work, it will grind holes as small as 1" dia. The extremely rugged bed provides the strength and rigidity necessary for vibrationless operation. The workhead has two positions, one for grinding, and a forward position for ease in loading and checking large work. The wheelhead is adjustable to grind up to 15° included angle. Workhead and wheelhead slides are anti-friction to provide extremely accurate grinding and sensitive control. Write for illustrated folder.

Bryant Chucking Grinder Co., Springfield, Vermont, U. S. A.

bryant
thread gaging

Bryant gages are built on the principle of an "expanding" master plug for checking internal parts, or a "contracting" master ring for checking external threads. A dial indicator gives a reading of P.D. which includes variation in thread form and lead. This is an accurate indication of assembleability.

The Bryant Internal Recess & Diameter Gage



THIS is basically a split plug gage for inspecting internal recesses in parts such as "O" rings, and snap rings. It is equally effective for bench inspection or for gaging internal recesses and diameters on parts still held in the machine, or in large work that is difficult to move to the inspection department. One gage, with various bore or recess type segments, will check from 5 16" to 5" in diameter. Write for catalog describing full line of Bryant Thread Gages.

what has a fishing plug to do

with FIRTHITE STANDARD TIPS

R-264

When a good fisherman buys a quality plug, it is usually contained in a plastic case so that he can easily store, identify, and protect the beauty. The same packaging technique has just been adopted by Firth Sterling, Inc. for its high quality Standard Carbide Tips. Now Firthite Tips are being delivered to you in plastic containers specifically designed for ease in handling, convenience in stocking, simplicity in identifying, and protection in storing.

FROM STOCK BINS TO YOU

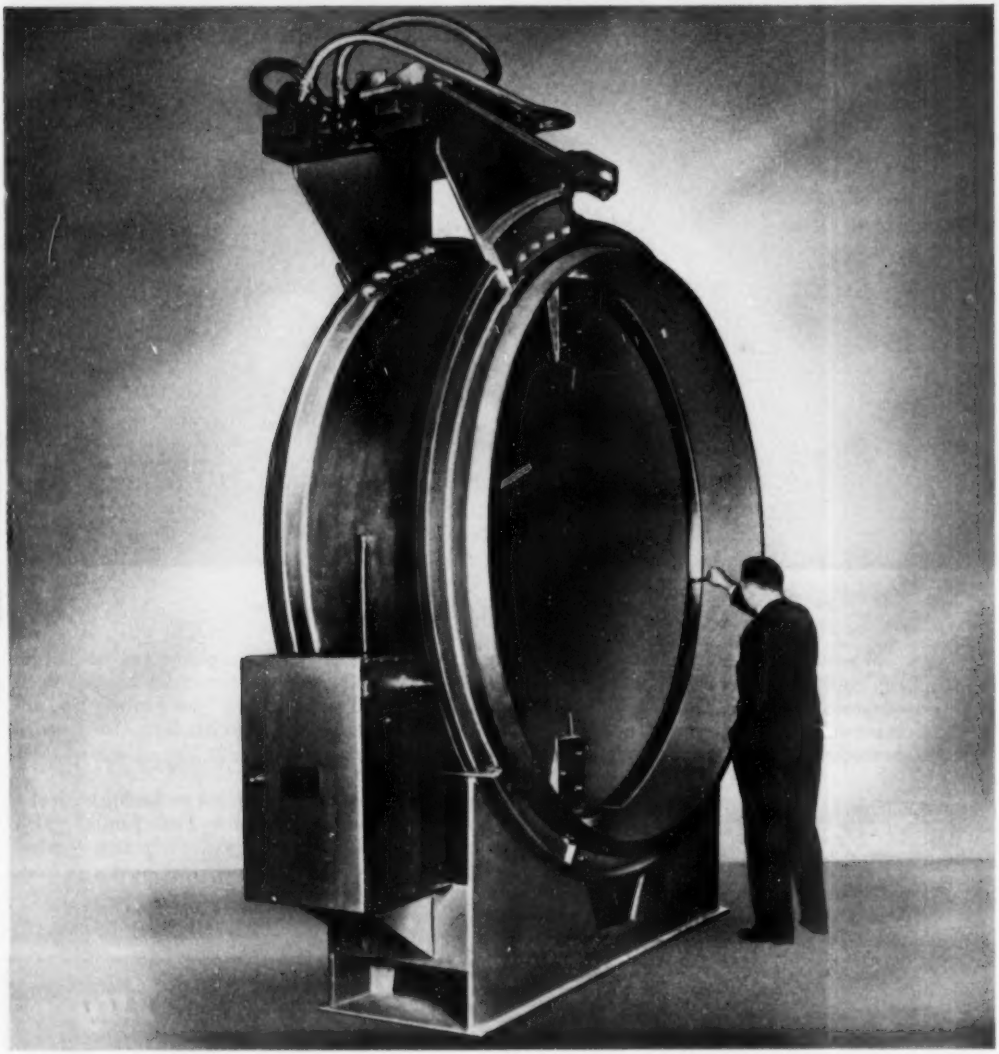
This and other innovations in modern packaging are just a part of a new merchandising program by Firth Sterling which is centered on the creation of an entirely new Central Commodity Store Room for more efficient service to you.

Firth Sterling INC

OFFICES* AND WAREHOUSES: HARTFORD NEW YORK* DETROIT CLEVELAND DAYTON* PITTSBURGH* CHICAGO BIRMINGHAM* LOS ANGELES PHILADELPHIA*

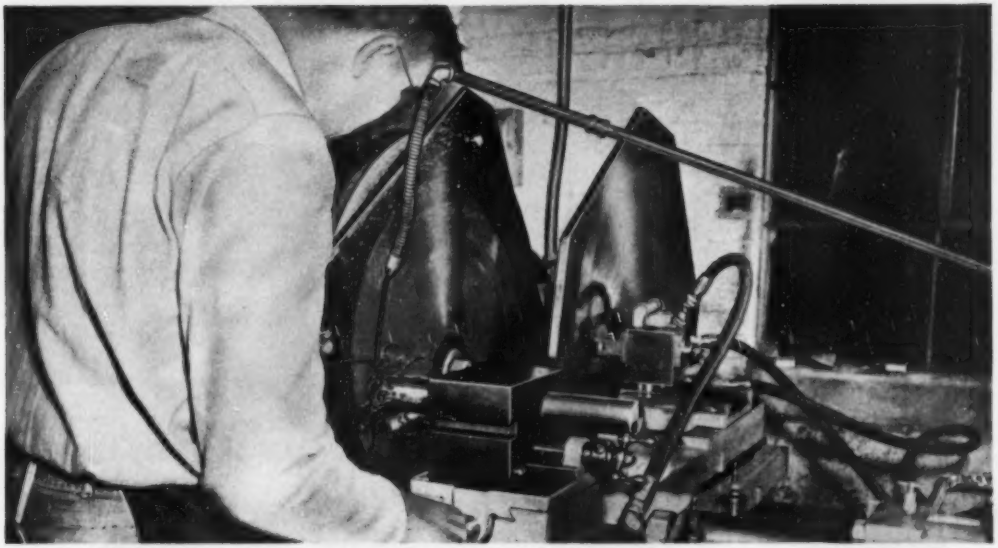
GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

CUTTING TIME ON .....YET FINISH IS



One of the stress seal valves made by Henry Pratt Company. Machining time of valves' hub seal plate was halved with a Sinclair Cutting Oil.

INCONEL HALVED IMPROVED!



Contour machining of a hub seal plate for a stressed seal butterfly valve.

The Dixon, Illinois, plant of the Henry Pratt Company makes stress seal valves from 30" up to 144" in diameter that seal tight at pressures up to 300 P.S.I.

For the sealing band, Pratt uses INCONEL "X"®. This material poses rugged machining problems and preliminary machining efforts indicated excessive heating of the metal and tool wear resulting in a rough finish.

On the critical portion of the band, the hub seal plate, the company tried one of the Sinclair cutting oils with higher film strength, anti-weld qualities and cooling ability. Results? Time for turning this plate was *reduced from 9 to 4 hours*—and the *finish was greatly improved.* Also tool life was materially lengthened, meaning less downtime for the lathe.

This cutting oil, or one of the other Sinclair cutting oils and coolants, might ease *your* production headaches. It costs nothing to find out. Contact your Sinclair Representative or write Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

SINCLAIR CUTTING OILS and COOLANTS FOR METAL WORKING

ARMSTRONG
TOOL HOLDERS

Equip with
ARMSTRONG TOOL HOLDERS
for Defense production

A change over to new products, starts in the tool room and the die shop . . . starts with ARMSTRONG TOOL HOLDERS. In preparing for defense orders, the logical first step is to check your stock of ARMSTRONG TOOL HOLDERS. With the correct types for every operation, and the correct sizes for each lathe, planer, slotter and shaper, you will be able to start work on a moments notice.

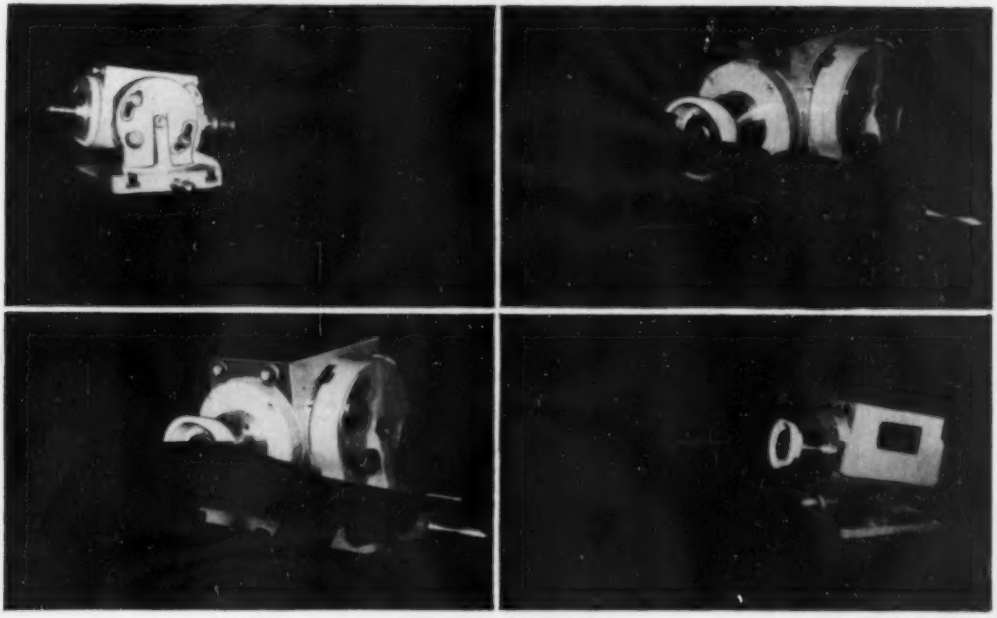
ARMSTRONG TOOL HOLDERS reduce "tooling-up" to the selection of a cutter and tightening of a set screw. They permit operation at higher speeds, and heavier feeds than are customary—they enable you to produce more pieces per hour, per man, per machine.

Produced by modern methods, in a specially-built tool plant, they are the lowest cost tooling you can buy. And, they are as available as your telephone for they are carried in stock by your local supply house.

Use ARMSTRONG TOOL HOLDERS wherever possible for lower tool cost, saving in High Speed Steel, increased output and greater profit. *Write for Catalog*

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"* 5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

LOOK AT THE NEW AND BETTER WAY TO GRIND TOOLS. .



THE NEW POPE SUPER PRECISION
1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER HEAD

With Angular Adjustment In A Vertical Plane

Specify this new and better motorized Spindle on your next tool and cutter grinder.

Replace less effective, less versatile heads on your present grinders.

This totally enclosed POPE Spindle with sealed-in lubrication has the radial and axial rigidity to make wheels cut faster — spark out quicker.

It produces the kind of cutting edge on your tools that stands up and cuts longer.

It is easy to install.

It reduces set-up time.

It reduces grinding time.

Ask us for a quotation

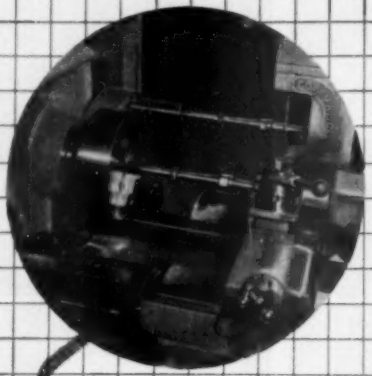
No. 89

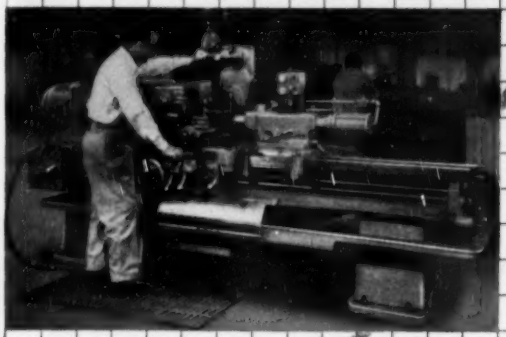
POPE

POPE MACHINERY CORPORATION
[illegible] STREET • HAVERHILL, MASSACHUSETTS
BUILDERS OF PRECISION GRINDERS

(Oil equipment manufacturer reports)

production increased at least 60%





with Lodge & Shipley copymatic

COPYMATIC form turning various oil well equipment items at Otis Engineering Corp., manufacturing affiliate of well-known Otis Pressure Control, Inc., Dallas, Texas.

In the production of sub-surface controls which must be placed and operate in oil well casings far underground, the precision and speed of the Lodge & Shipley COPYMATIC Lathe are valuable assets. This manufacturer says, "tolerances can be held closer . . . the COPYMATIC can be used as tracer type or conventional lathe . . . is very easy to operate."

On a typical job, 303 Stainless is turned for O.D. and taper at 549 RPM and .0067" feed, using Kennametal K3H tools. On this and other jobs involving form boring and threading, the user "has been very successful in decreasing production costs over the use of conventional lathes."

In any size shop . . . on a multitude of operations . . . the speed and versatility of the COPYMATIC, coupled with the accuracy of the Lodge & Shipley Model X Lathe, turns out more work at lower cost. For additional case histories, complete details, write:

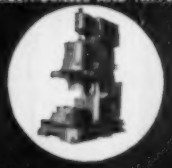
THE Lodge & Shipley COMPANY
3059 Colerain Avenue
CINCINNATI 25, OHIO

Your "Hole" Future

IS ASSURED WITH NATCO EQUIPMENT

ENGINEERED FOR QUALITY AND QUANTITY PRODUCTION

ADJUSTABLE SPINDLE MULTI-DRILLER AND TAPPER

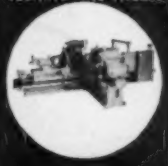


MEDIUM SIZED VERTICAL DRILLER AND TAPPER

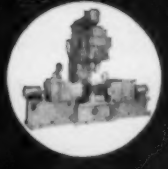
HIGH-SPEED MULTI-DRILLER OR TAPPERS

A-33 LIGHT SENSITIVE MULTI-DRILLER OR TAPPERS

2-WAY BOREFACE FOR BORING, TURNING AND FACING



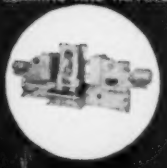
3-WAY HOLETAPPER WITH INDIVIDUAL LEAD SCREWS



HOLESTEEL 2-WAY FLOOR TYPE FOR DRILLING AND TAPPING

HOLEWAY AUTOMATIC PROCESSING MACHINES

2-WAY HOLEUNIT FOR DRILLING, BORING, REAMING AND TAPPING



STATION TYPE MACHINES

multi-

...es ... from

... from 1/16 inch

...s worked include iron, steel,

... wood. Call a NATCO Field Engineer.

Call a Natco Field Engineer

To help you solve your problems in Drilling, Tapping, Boring & Facing.

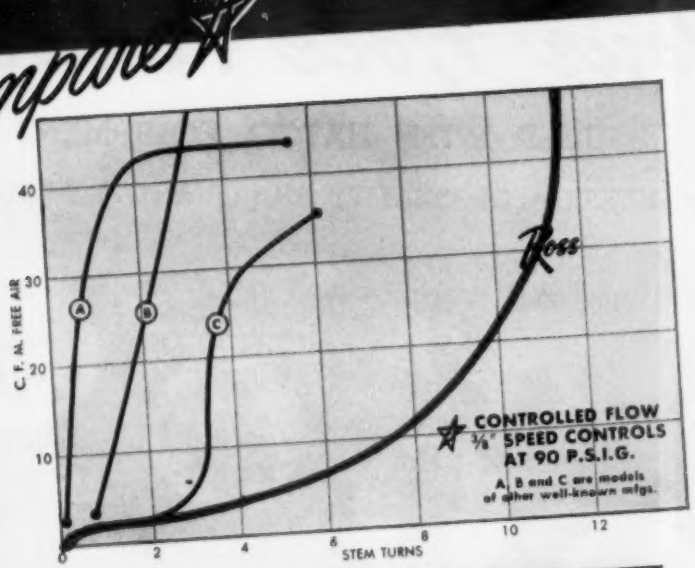
NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit
1907 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

Compare ☆



☆ Free flow capacity of the Ross Speed Control Valve is 25% TO 125% GREATER.

Ross

Speed Control Valve

☆ Easy-to-adjust control flow

☆ Maximum free-flow

☆ Simple, dependable, rugged

☆ Small, lightweight

Control

Write for complete details.

ROSS OPERATING VALVE COMPANY

120 E. GOLDEN GATE AVE., DETROIT 3, MICHIGAN

HARDINGE
ELMIRA, N.Y.

TOOL ROOM LATHE

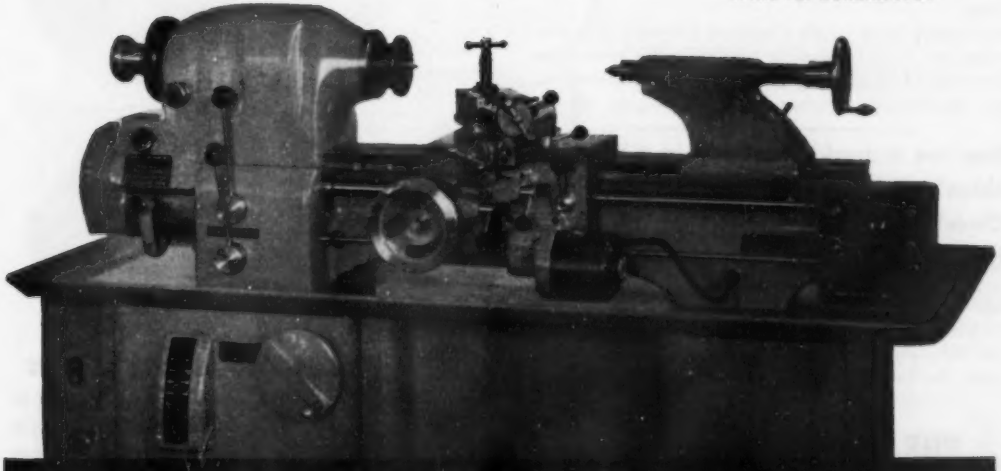
Features QUICK *Feed Change*

Simply TURN KNOB FOR EXACT FEED REQUIRED

CHANGE FEEDS WITHOUT STOPPING SPINDLE OR CHANGING OR SHIFTING GEARS

COARSE FEED | MEDIUM FEED | FINE FEED

Write for Bulletin HLV



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

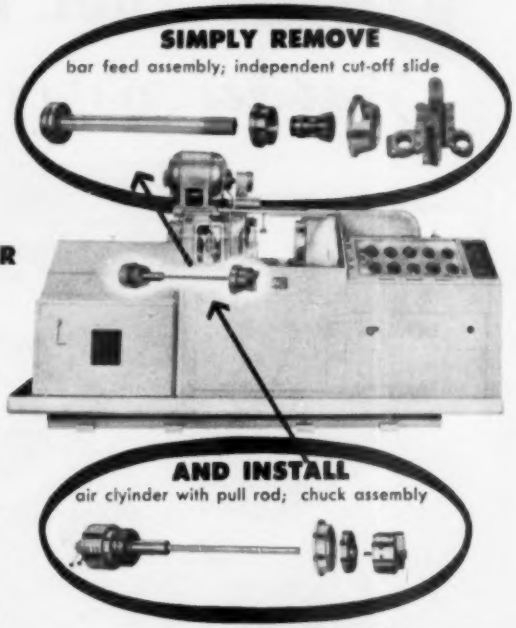
You save 2 ways

WITH THE DOUBLE-DUTY

CLEVELAND

CLEVELAND MODEL AB DIALMATIC IS *convertible* FROM A BAR MACHINE TO A CHUCKER *in 30 minutes!*

Cleveland Model AB Dialmatic Single Spindle Bar and Chucking Automatic. 2½" and 3" Bar Capacity; 6" Chucking Capacity.



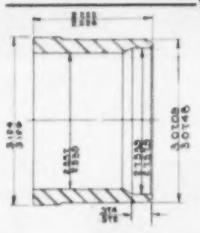
Essentially a high-production single spindle bar machine, the Model AB Cleveland Dialmatic *doubles* its utility by being quickly convertible to a chucking automatic. This and many other features make the Model AB the *most versatile single spindle automatic in the field.*

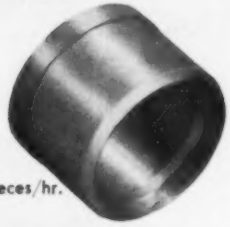
The ease with which it can be set up makes this Cleveland highly economical for the production of short run jobs formerly produced only on hand-operated machines. *No cam changes* are needed to adjust turret tool feeds—they're *electrically* controlled—simply set by positioning dials on the control panel. Cross slides are controlled by separate, adjustable drums. Cross slide tools are quickly set relative to turret operations without use of special camming.

The spindle speed range is exceptionally wide. 112 speeds are available ranging from 24 to 1820 r.p.m. That gives you efficient cutting speeds for both bar and chucking work as well as for all kinds of metals and all types of tools.

A complete study of the Cleveland Dialmatic will convince you of its cost-cutting capabilities for your shop. Let a Cleveland sales engineer give you full information. For machine specifications, write for Bulletin AB.

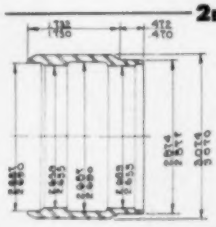
1st OPERATION

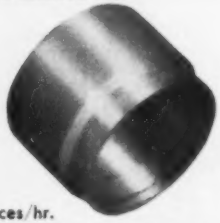




29 pieces/hr.

2nd OPERATION





17 pieces/hr.

Ever see a chucking job run in a bar machine? Shown at right is how the 2½" Cleveland Dialmatic does it — producing the part illustrated from a steel forging.

Cleveland's convertibility also gives you cost advantages as you can machine 1st operations on a part as a bar job and complete the part by performing 2nd operations using the chucking attachment.

Remember: *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines

JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J & L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J & L chasers.

RADIAL CHASER TYPE
Capacities from #8 to 4¼"

TANGENT CHASER TYPES
Stationary and Revolving. Capacities from #4 to 2"

Some of the reasons why:

COMPACT, RUGGED DESIGN GIVES MAXIMUM SUPPORT TO THE CHASERS. J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING. This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

EASY, CONTROLLED RESHARPENING. J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.

Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A. **DIE HEAD DIVISION**

POWER CONSUMPTION & MAINTENANCE CUT WITH

STERLING SLO-SPEED!

The Slo-Speeds that have been installed on our synchronized dual conveyor system and Solem Sander have resulted in reducing tremendously our maintenance costs as well as power consumption through a reduction of horsepower... the conveyor system, originally designed for two motors, is driven satisfactorily by only one Slo-Speed, and a 2 H.P. Slo-Speed replaced a 5 H.P. motor of another make on the sander, reports E. Douglas Johnson of Higgins, Inc., New Orleans.

STERLING SLO-SPEED GIVES YOU THE ONE BEST LOW SPEED AND

gives uninterrupted service—carries heavy overhung loads—provides versatile mounting and flexibility in arrangement of machinery—saves valuable space—provides greater safety—costs less to install and use. An indispensable source of low speed power for:

Agitators	**Dryers**	**Presses**
Blenders	**Feeders**	**Pumps**
Blowers	**Kilns**	**Screens**
Conveyors	**Mills**	**Tumblers**
Cookers	**Mixers**	**Etc., etc.**

OTHER STERLING ELECTRIC POWER DRIVES:
• STERLING SPEED-TROL (VARIABLE SPEED) MOTORS
• STERLING KLOSD AND KLOSD-TITE (NORMAL SPEED) MOTORS
DRIP-PROOF • SPLASH-PROOF • TOTALLY ENCLOSED

70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. D-100.

OUTSTANDING FEATURES:
Simplified gear system—balanced design—compact—rugged—highly efficient—abundant lubrication—low output shaft—positive oil seals—Herringbone Rotor—protected—streamlined—direct through ventilation—quiet operation—AGMA speeds—extremely long life—every unit will operate in any position.

STERLING ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio, Los Angeles 22; Hamilton, Canada; Santiago, Chile.
Offices and distributors in all principal cities.

"where can I get a good, small general purpose hydraulic press... *quickly?*"

"HANNIFIN HAS THEM FROM 1 TO 10 TONS FOR PROMPT DELIVERY!"

Yes, Hannifin is your best source for small, general purpose hydraulic presses. And, you can get *almost* immediate delivery because the demand for these popular presses is so consistent that Hannifin is able to make them in quantity.

This *continuous* quantity production works to your advantage price-wise, too, because the savings of volume production are passed along.

The quality of these small presses is identical to that of the larger Hannifin presses that are built to order. Fast acting, single-lever and dual-lever manual controls are standard, but optional controls, including Hannifin's patented Sensitive Pressure Controls, are available on the 5-, 8- and 10-ton models. Maximum pressure can be adjusted from 10% of capacity to full capacity on all models.

select the press you need from this chart...

CAPACITY, tons	1-ton	2-ton	5-ton	8-ton	10-ton
MODEL NUMBER	F-10	F-20	F-50	F-80	F-101
RAM SPEED (in.–min.) Down	400	190	120*	73*	130
RAM SPEED (in.–min.) Up	800	345	240*	151*	254
PUMP (gpm.)	3.3	3.3	5*	5*	11
MOTOR (hp)	1½	1½	2*	2*	5
STROKE (in.)	6	6	10	10	12
GAP (in.)	10	10	16	16	22
REACH (in.)	6	6	7½	7½	10
BULLETIN	H-784	H-784	135	135	134

PRICES WILL BE SENT PROMPTLY ON REQUEST

Check ✓ *THE BULLETINS YOU WANT ON THE COUPON*

**Supplied with larger motor and pump when higher ram speed is required.*

mail the coupon!

Hannifin Representatives Are at Your Service in These Leading Industrial Centers

Atlanta, Buffalo, Cincinnati, Cleveland, Dallas, Dayton, Denver, Detroit, Houston, Los Angeles, Milwaukee, Minneapolis, Moline, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, Seattle; Richmond, Va.; Rochester, N. Y.; South Bend, Ind.; Washington, D. C.; Worcester, Mass. In Canada: TEM Sales Company, Toronto

HANNIFIN

Hydraulic and Pneumatic Presses from ½ Ton to 150 Tons
Air and Hydraulic Cylinders • Riveters • Air Control Valves

Hannifin Corporation
1117 S. Kilbourn Ave., Chicago 24, Ill.

Please send bulletins checked, together with prices:

☐ Bulletin H-784 ☐ Bulletin 135 ☐ Bulletin 134

Name.....

Position.....

Company.....

Address.....

City.....*State*.....

U·S·S Carilloy steel springs soak up

Alloy springs cushion tremendous mechanical shocks in 200-ton short-circuit generators ...save expense of forgings

IN testing high-voltage circuit breakers, engineers at General Electric Company *intentionally* short-circuit two huge motor-driven generators. Each of these test generators is normally rated 125,000 kva, but provides short-circuit currents as high as 182,000 amp, instantaneous, offset wave, corresponding to about 1,625,000-kva rms symmetrical short-circuit duty. Such operation causes tremendous mechanical stresses to build up inside each machine. These stresses create a torque that tries to twist loose the 200-ton stator assembly. But no damage is done! These powerful machines are mounted on U·S·S CARILLOY steel plate springs that cushion the shock and then damp out any vibrations that follow.

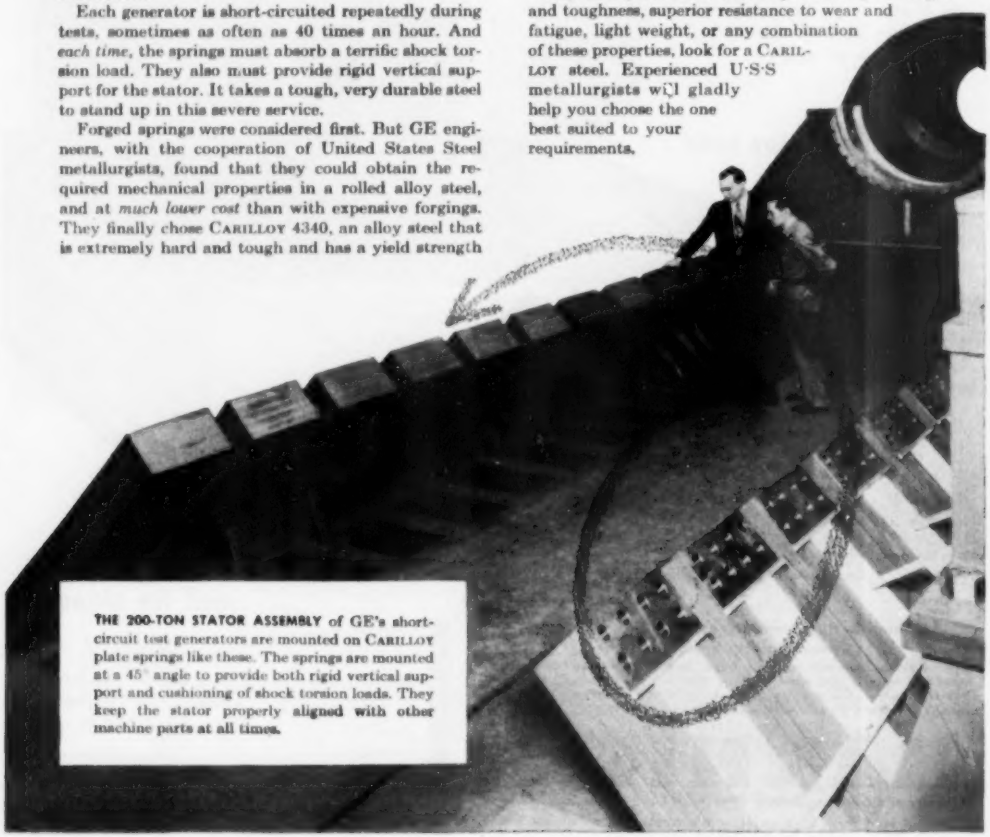
Each generator is short-circuited repeatedly during tests, sometimes as often as 40 times an hour. And *each time*, the springs must absorb a terrific shock torsion load. They also must provide rigid vertical support for the stator. It takes a tough, very durable steel to stand up in this severe service.

Forged springs were considered first. But GE engineers, with the cooperation of United States Steel metallurgists, found that they could obtain the required mechanical properties in a rolled alloy steel, and at *much lower cost* than with expensive forgings. They finally chose CARILLOY 4340, an alloy steel that is extremely hard and tough and has a yield strength of about 100,000 psi. This insures good endurance at 40,000 psi as required in this rugged application.

Also important was the fact that CARILLOY 4340 is easy to heat treat. Plates were furnished to GE quenched, tempered, and special cut and stress relieved.

This steel is giving excellent service. Initial vertical displacement of each generator was only 0.35 mils. Under the most severe short circuit, developing a whopping *8 million lb. ft.* of torque, frame rotation is about ½ in. each way at the point of attachment of the springs. The axial centerline of the machine stays within 30 mils of its normal position. These movements are sufficient to cushion the shock effectively.

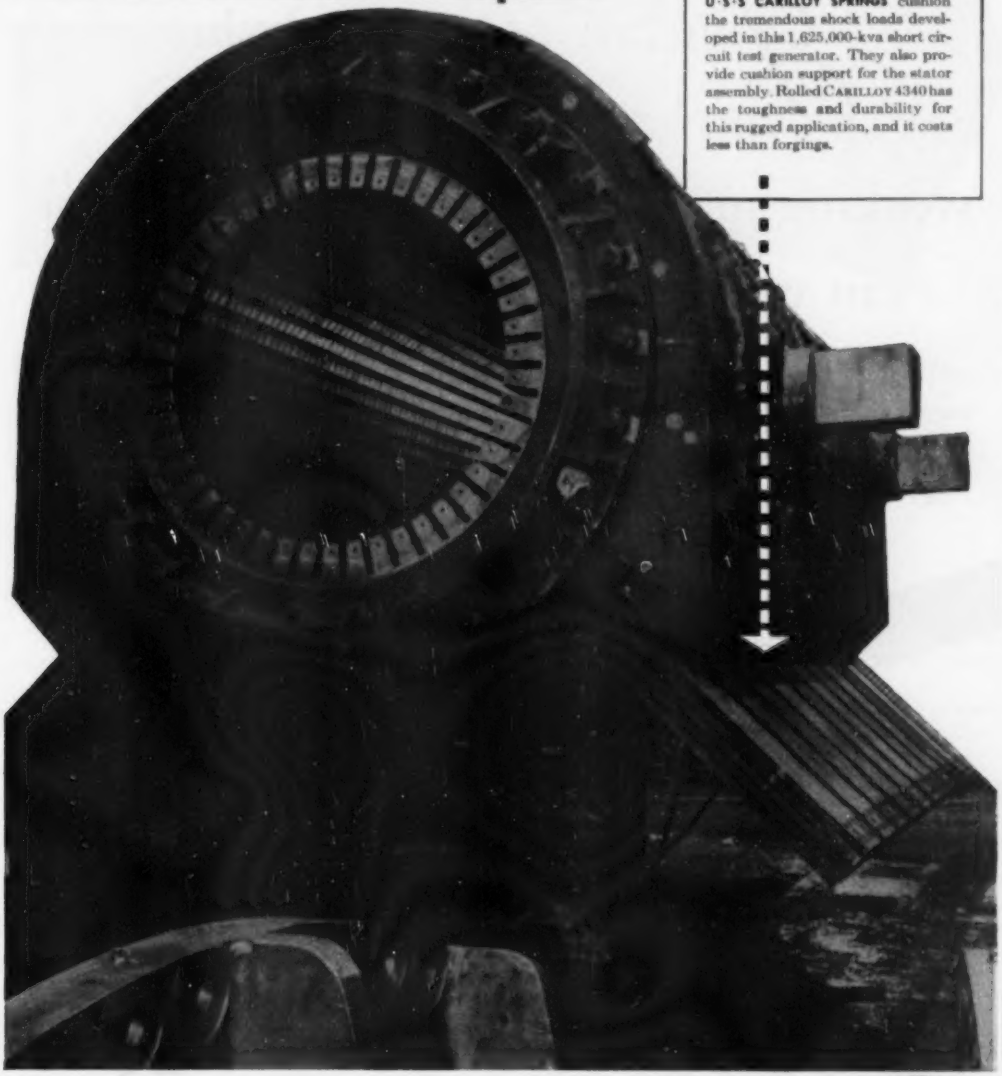
Any time you need a steel to provide high strength and toughness, superior resistance to wear and fatigue, light weight, or any combination of these properties, look for a CARILLOY steel. Experienced U·S·S metallurgists will gladly help you choose the one best suited to your requirements.



THE 200-TON STATOR ASSEMBLY of GE's short-circuit test generators are mounted on CARILLOY plate springs like these. The springs are mounted at a 45° angle to provide both rigid vertical support and cushioning of shock torsion loads. They keep the stator properly aligned with other machine parts at all times.

8 million lb.-ft. torque!

U·S·S CARILLOY SPRINGS cushion the tremendous shock loads developed in this 1,625,000-kva short circuit test generator. They also provide cushion support for the stator assembly. Rolled CARILLOY 4340 has the toughness and durability for this rugged application, and it costs less than forgings.



U·S·S Carilloy Steels

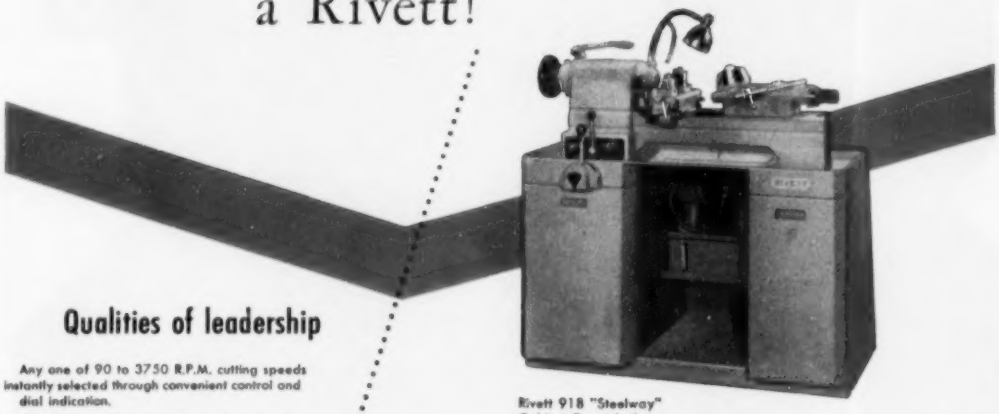
USS

UNITED STATES STEEL COMPANY, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

D-1949

UNITED STATES STEEL

You can use other lathes.... employ other types of metal-working machines....but on no other tool can you get so much production with such fine precision as on a Rivett!



Rivett 918 "Steelway" Cabinet Turret Lathe

Qualities of leadership

Any one of 90 to 3750 R.P.M. cutting speeds instantly selected through convenient control and dial indication.

Double-bevel steel ways, hardened and ground, provide maximum bearing and positive centering action.

Optional stationary or draw-in collet with greater capacity and accuracy.

Convenient lever chuck closer may also control spindle drive and brake with opening and closing of collet.

Produces small duplicate parts speedily in unlimited quantities with precision known only to the toolroom. The accuracy for which Rivett has long been a symbol is combined with time-saving features that reduce set-up and cutting operations to a fraction of that normally required.

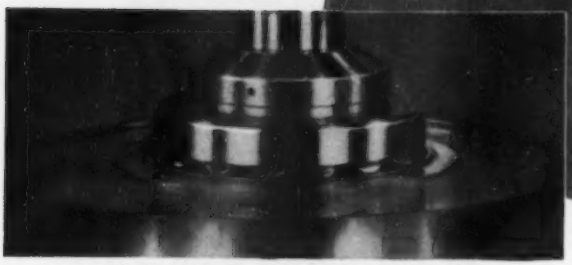
Get proof of what the 918 will accomplish. Send for Bulletin 918-57.

RIVETT LATHE & GRINDER, Inc.

Dept. AMR-11, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

Here's the Bearing for Heavy THRUST LOADS At High Speeds



SKF Spherical Roller Thrust Bearing showing typical vertical mounting prior to operation. Note the static oil level and compare it to the oil action illustrated below.

As the bearing rotates note how the lubricant is pumped outwardly along the rollers against the inner ring guide flange. This design assures perfect lubrication, low torque, long, trouble-free life.

SKF Spherical Roller Thrust Bearing is your answer where the problem is to support heavy thrust loads at high speeds on vertical or horizontal shafts.

- It has High Thrust Capacity — designed to carry heavy thrust loads, or combined loads which are predominantly thrust.
- It Is Fully Self-Aligning — has a single row of rollers which roll on a spherical outer race with full self-alignment.
- It Has A Ring-Centered Cage — constructed so lubricant is pumped directly against inner ring's high guide flange.
- It Has Low Friction Torque — an efficient oil film is developed between the roller and surfaces and the guide flange, when running.

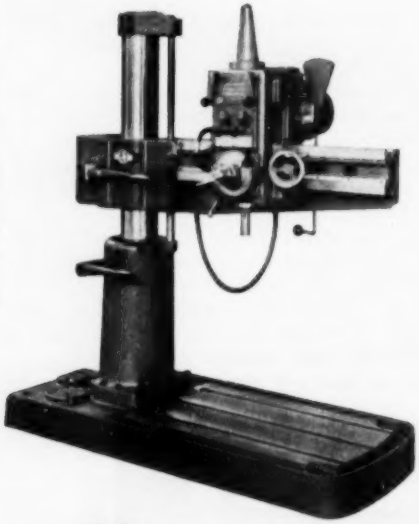
Catalog #285 gives you all the dimensional data on SKF Spherical Roller Thrust Bearings. Send for your copy to **SKF INDUSTRIES, INC.,** PHILADELPHIA 32, PA.,— *manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.* 7332

SKF
BALL AND ROLLER BEARINGS

IN EVERY INDUSTRY, SKF Puts The Right Bearing In The Right Place

put drill work in these sizes

on the C-O Cincinnati 3'-7" radial and save three ways



Chances are, nine-tenths of your drilling calls for 1" diameters or less—a work range that C-O Cincinnati 3'-7" Radials can step right into and start saving.

Savings in first cost: the price is low and your investment is written off more quickly. **Savings in operation:** C-O Cincinnatis go easy on floor space, set-up time, power consumption—help lower overall cost-per-piece. **Savings in better balanced work loads:** they take over small work, free larger radials for most efficiency on big jobs.

And low price goes right along with well-known C-O Cincinnati quality: all-geared heads, automatic pressure lubrication, 9 spindle speeds (30 to 1 overall ratio), 6 power feeds, flame hardened transmission gears . . . all shafts mounted on anti-friction bearings . . . ground tubular steel columns mounted on Timken tapered bearings . . . simple, trouble proof column and arm clamps, hardened and ground head rails on arms and extra heavy bases.

Write for catalog D-121 and the name of your nearest distributor.

CANEDY-OTTO DIVISION

CINCINNATI 9, OHIO, U.S.A.

cincinnati lathe & tool co.

Production rate up 1100% when switch is made to

CARD TAPS

The job was tapping soft steel parts made from SAE 1010 steel. The holes were extruded and tapped $\frac{3}{8}$-18 NPT. But with the taps being used a midwest metal fabricator was getting only 200 to 300 tapped holes, which was considered pretty good at the time.

Then somebody said he really ought to be getting more, so the shop superintendent decided to investigate. He called in a Card representative and talked over the matter with him. Solution: A Card High Speed Interrupted Pipe Tap was put on the job. Result: 4,267 tapped holes — or an increase in production of more than 1100%.

Meet him. Your Card representative, backed by Card's engineering staff is always available for aid on any problem. S. W. CARD MANUFACTURING COMPANY, Mansfield, Massachusetts. Division of Union Twist Drill Company.

SEE YOUR CARD DISTRIBUTOR FOR PROMPT DELIVERIES AND HELPFUL SERVICE

The CARD Quality

TAPS

Production Proved For Lasting Accuracy

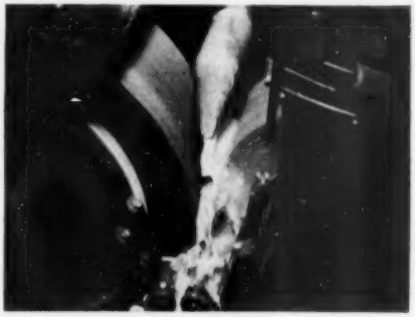
Also makers of DIES • SCREW PLATES • DIE STOCKS TAP WRENCHES

A producer of worm gears has found that either a Robertson 20" x ¼" x 8" RA463-JV or a Robertson 16" x ⅜" x 8" RA542-JV Wheel finishes pieces in the fewest number of cuts, at higher work speeds, and with great accuracy. They have smashed all previous records in grinding hardened triple-lead worm shafts.

YOU OFTEN GET 3 TO 5 TIMES AS MUCH PRODUCTION PER WHEEL-DRESSING WITH ROBERTSON COOL-CUT WHEELS

Production-wise manufacturers throughout the country report that Robertson Cool-Cut Grinding Wheels are increasing output as much as five times per wheel-dressing. That's because the unique open structure of these wheels permits chip clearance, enables the grains to remove the metal without loading.

Hundreds of users, on many different grinding operations, find that Robertson Wheels work better, cut faster and last longer than conventional close-grained wheels. Why not try Robertson? You'll get top results, even on the toughest grinding operations.

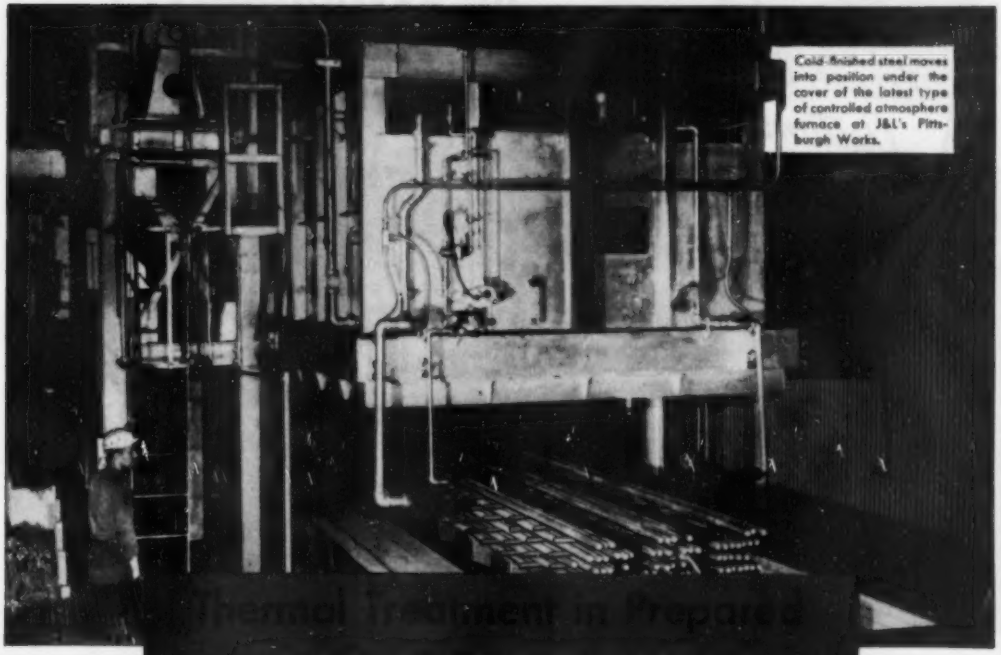


A producer of drop forgings making cotter-pin rivets for temporary bridge structures was taking off ⅛" stock on a plunge cut and getting only 25 rivets per wheel-dressing. This output wasn't enough. After consulting a Robertson engineer, he installed a Robertson SA54-QV Wheel. Production increased to 125 rivets per dressing.

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

Let J&L CARBON RESTORED Cold Finished Bars cut your production costs



Cold-finished steel moves into position under the cover of the latest type of controlled atmosphere furnace at J&L's Pittsburgh Works.

ATMOSPHERE FURNACE

Why incur the cost of removing "decarbed" surface from parts requiring high surface hardness? To eliminate these costs and lower your unit production cost, simply order J&L Cold-Finished Carbon Restored Bars.

This furnace is designed to permit other thermal treatments, such as annealing, normalizing, stress relieving and strain drawing. These treatments can be employed to improve machinability or to meet desired mechanical properties.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

J&L STEEL

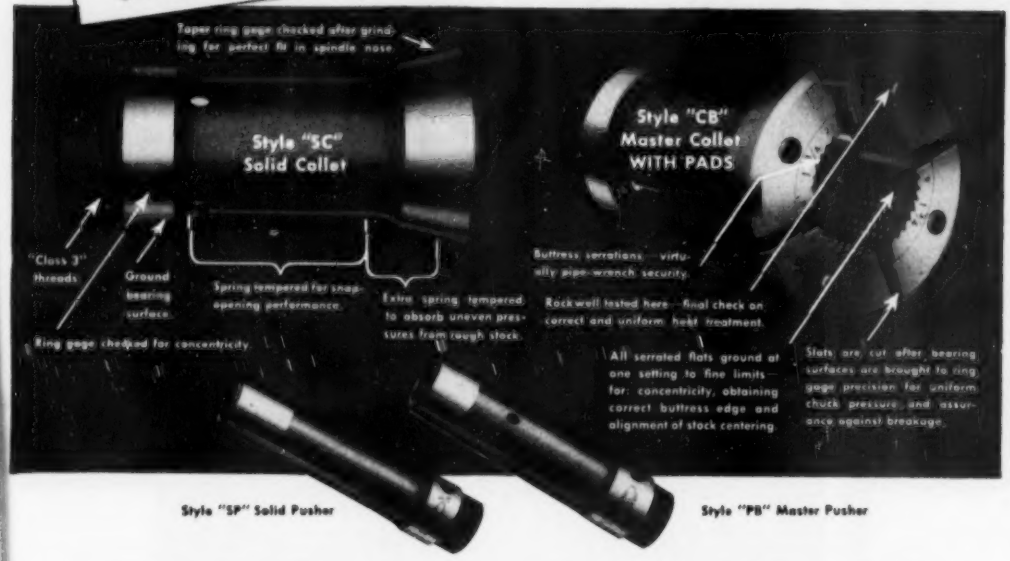
Jones & Laughlin Steel Corporation
402 Gateway Center, Pittsburgh 30, Pa.

☐ Without obligation please send me your booklet "Extra Services to Users of Cold Finished Steel."
☐ Please have your representative call.

NAME _____
TITLE _____
COMPANY _____
ADDRESS _____

Memo—to the users of 45,000 Acme-Gridley Automatics

CHECK THESE FEATURES OF NAMCO COLLET PERFORMANCE:


Taper ring gage checked after grinding for perfect fit in spindle nose
Style "SC" Solid Collet
Style "CB" Master Collet WITH PADS
"Class 3" threads
Ground bearing surface
Ring gage checked for concentricity
Spring tempered for snap-opening performance
Extra spring tempered to absorb uneven pressures from rough stock
Buttress serrations—virtually pipe-wrench security
Rockwell tested here—final check on correct and uniform heat treatment
All serrated flats ground at one setting to fine limits—for: concentricity, obtaining correct buttress edge and alignment of stock centering
Slots are cut after bearing surfaces are brought to ring gage precision for uniform chuck pressure and assurance against breakage
Style "SP" Solid Pusher
Style "PB" Master Pusher

National Acme collets and pushers are built by National Acme for National Acme machines and are available only from National Acme.

This is important for you to remember. It is your positive assurance of top performance. These National Acme components are made to function properly on *your Acme-Gridley*—designed on the basis of our fifty years' experience with the stock feed functions of this type of machine.

We offer you no trick designs—just sound engineering practice, enabling us to assume the same responsibility for the high performance of these stock feed components as we do for the machines to which they are engineered. For peak performance specify Namco, both for multiple and single spindle Acme-Gridley automatics and for the pushers, collets and pads used on them.

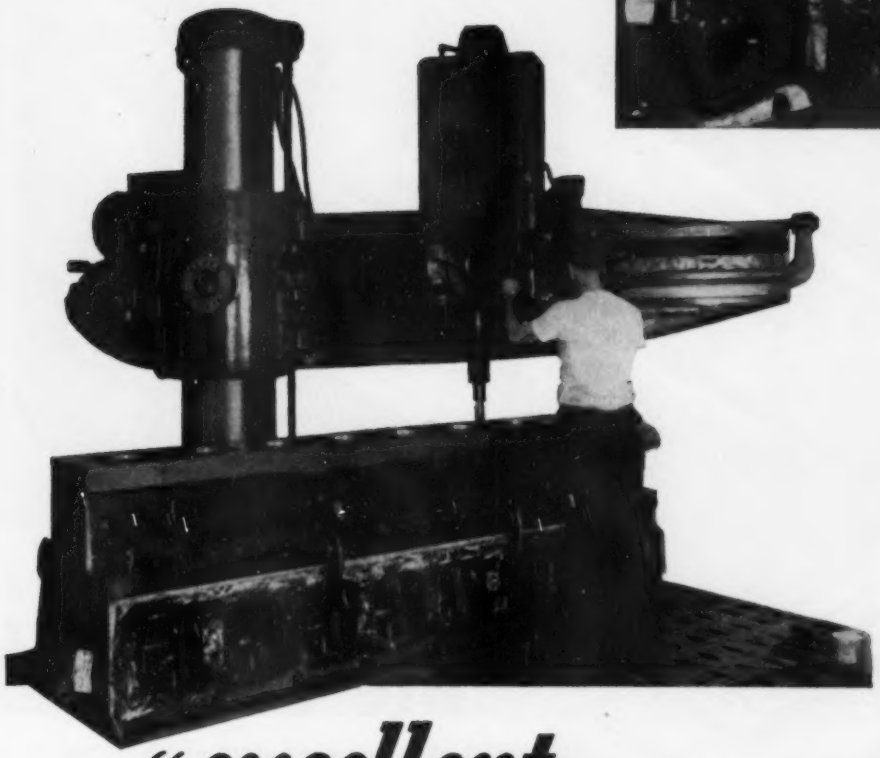
Complete details and prices on all National Acme collets, pushers, pads and bushings for Acme-Gridley automatics are contained in a separate Stock Feed Components Catalog, No. CP-49. Ask for your copy.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

This battery of Cincinnati Bickford Super Service Radial Drills is drilling, tapping and reaming smaller parts.



"excellent in all respects..."

The ease of handling, the performance, accuracy and speed of the 7' arm, 19" diameter column Cincinnati Bickford Super Service Radial Drills "rated excellent in all respects."

The job involved drilling, tapping, reaming of 43 holes in a large diesel cylinder block.

A battery of smaller Cincinnati Bickford Super Service Radial Drills is also giving "excellent" performance.

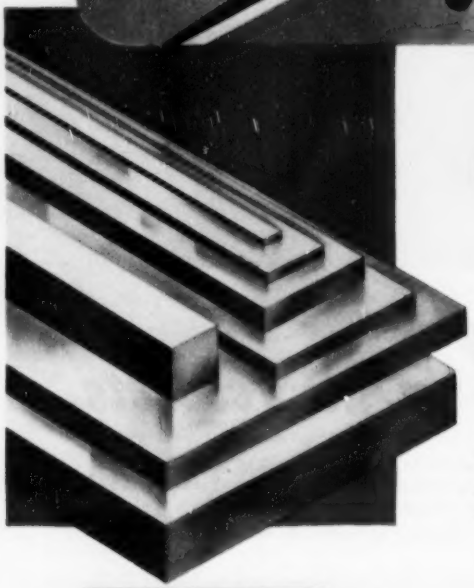
Write for descriptive circular of these fine machines.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.



SIMONDS

Now Makes Both Types of Flat Ground DIE STEEL

Simonds offers you a choice of OIL or AIR Hardening DIE STEEL, whichever is best suited to your requirements. Both types are made from Simonds own steel, are precision ground to a thickness limit of plus or minus .001" and have an extra smooth surface finish of 25 to 35 micro inches. Edges and ends are square and parallel, with all scale, decarburation and surface defects removed. All sizes come individually packaged with heat treating instructions.

SIMONDS AIR HARDENING DIE STEEL

(non-deforming 5% Chrome Type) is spherodize annealed for good machinability and uniform hardenability. Its wide hardening range (1700° to 1800° F.) makes it practically foolproof in heat-treating. Stock sizes run from ½" to 2" thick and 2" to 10" wide in 36" lengths.

SIMONDS OIL HARDENING DIE STEEL

(non-deforming Molybdenum Type) is uniformly annealed for easy machining and uniform hardening. Due to its wide hardening range (1450° to 1540°) good results are assured with even the simplest heat treating equipment. Stock sizes are available from ¼" to 3" thick and ⅛" to 14" wide in 18" lengths. The heavier sizes also come in 36" lengths.

Try a bar on your next job. Your Simonds Distributor carries many sizes of both types in stock — call him right now.

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon. Canadian Factory in Montreal, Que. Southern Service Shop in Meridian, Miss. (formerly J. H. Miner Saw Mfg. Co.). Simonds Divisions: Simonds Steel Mill, Lockport, N. Y., Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada

Amazing "Friction Fighter"

extends bearing life as much as 17½ times...
stops oil drippage!
Saved $1275 on one machine!

ALEMITE *Automatic* OIL-MIST

Now from Alemite—world leader in lubrication—comes this great friction fighting achievement. Alemite Oil-Mist! The most efficient, continuous, fully automatic system in the field of machinery lubrication.

Alemite Oil-Mist! The system that atomizes oil into *mist*—distributes it through tubing to bearings—bathes *all* bearing surfaces with fresh, clean, cool oil film. A system that simplifies and materially cuts the cost of machinery lubrication. And the lubricator unit has no moving parts.

Oil-Mist uniformly maintains oil film on plain and anti-friction bearings, gears and chains *regardless of variations in load, temperature or speed.* Eliminates the "human element."

Here! Direct from a field report is the latest proof of Oil-Mist results!

Before Oil-Mist: 100 hours was the average life of spindle bearings on the precision grinder of a leading manufacturer. Cost of each replacement—$85 for the bearing and labor. *Plus* downtime.

After Oil-Mist: The same grinder has run 1,638 hours without a bearing replacement! Total saving to date: $1,275 (after deducting both the cost of the Oil-Mist unit and installation). **Name on request*

ALEMITE OIL-MIST Lubricates All Types of Mechanisms

Alemite OIL-MIST Lubrication

A PRODUCT OF SW STEWART-WARNER

Check All These OIL-MIST Advantages!

- **Reduces bearing temperatures as much as 20%.**
- **Continuous, uniform lubrication of all bearings.**
- **Air pressure seals bearings against dirt.**
- **Reduces oil consumption—up to 90%.**
- **Prevents product spoilage.**
- **Eliminates guesswork—each bearing picks up as much Oil-Mist as it needs.**
- **Reduces starting and running torque.**

Get the Facts NOW!

Alemite, Division of Stewart-Warner, Dept. C-112
1850 Diversey Parkway, Chicago 14, Illinois

☐ Please send me a FREE copy of your new and complete Oil-Mist Catalog.

☐ Please have your Alemite Lubrication Representative arrange a desk-top demonstration of Oil-Mist. This entails no cost or obligation on my part.

My name _____

Title _____

Company _____

Street _____

City _____ State _____

for Quality Reamers stands alone

The Reamer Specialists

LAVALLEE & IDE, INC.
CHICOPEE, MASS.

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Coming Up

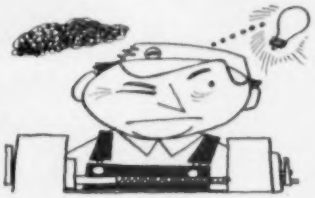
During the war, you published a booklet called Tools of the Trade. I had a copy of it and, although some of the stuff was a bit out of date, there was a lot of good, sound information in it. My copy finally fell apart, but when I sent for a new one they told me it was out of print. I don't expect you to set up a whole printing press just for me, but don't you have a spare copy hidden away somewhere that you could sell me? Or can you tell me where I might be able to get one? If you do reprint it, I am sure you could sell a lot because I know several men in our shop who have borrowed mine and would like to have one of their own.

Mike Stanwick
Rochester

This particular booklet has been out of print for some time, but a new series of up-to-date articles has been published and will soon be available in bound form. We lack one article to complete the series, and that will appear early next year. Immediately thereafter, we shall have the entire series available, probably under the old title.—Ed.

Quid Pro Quo

When a company employee invents something, he is likely to find out that he is not free to develop or market his invention because, when he was first hired, he signed a paper which assigned all his inventions to his company. All too often, he did

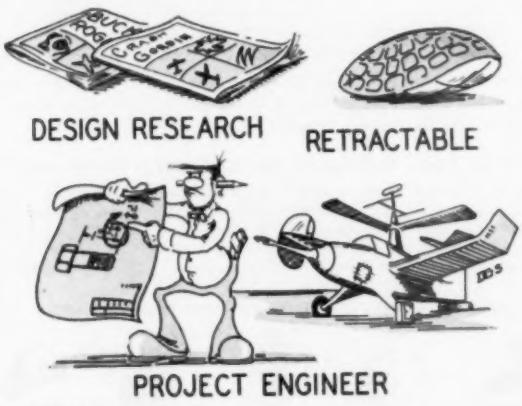


not really notice what he was signing, and if he needed the job badly enough he would not quibble about it because, usually, he had no idea that he might ever invent anything. But when the day comes that he does invent something, he finds that he agreed to turn it over to the company for "one dollar and other good and valuable considerations." Sometimes he does get the dollar, but he never sees the valuable considerations.

Some companies have a sensible attitude and give the man what the

GRINETICS

By D. G. SMITH



Republication rights reserved

MICROHONING is in your future

REFRIGERATOR COMPRESSORS

AIRCRAFT ENGINES

HYDRAULIC CONTROLS

GUN BARRELS

TRACTOR PARTS

AUTOMOTIVE ENGINES

If your operation requires the generation of accurate cylindrical or flat surfaces.

Hundreds of industrial plants have found that Microhoning not only improves the quality of the surface, but also increases production—reduces scrap, handling, and inspection costs.

No, you do not need a crystal ball.

The potentials of the Microhoning process can best be judged by the past accomplishments and present policy of the organization that developed it.

To give industry a complete service, the Micromatic Hone Corporation has an organization and sales policy unique in the machine-tool business. One well-coordinated organization sells, engineers, builds, and services the complete installation. Micromatic assumes full responsibility for all the equipment and the results obtained with the Microhoning process.

MICROMATIC HONE CORPORATION · DETROIT

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
Boston Post Road
Guilford, Connecticut

MICROMATIC HONE CORP.
614 Empire Building
26 So. Main Street
Rockford, Illinois

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

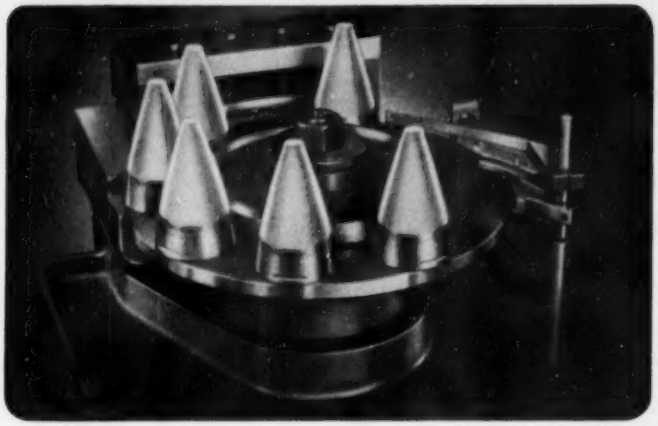
MICROMATIC HONE CORP.
1323 S. Santa Fe Avenue
Los Angeles 21, California

MICROMATIC HONE LTD.
55 George Street
Brantford, Ontario, Canada

REPRESENTATIVES: OVERGARD MACHINE TOOL COMPANY, 234 Commonwealth Bldg., Denver 2, Colorado
HALLIDIE MACHINERY CO., 2736 First Ave., South, Seattle, Wash. • REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

MICROHONING — STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

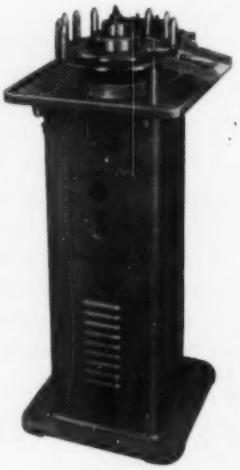
LEADERS IN INDUSTRY MARK WITH NOBLEWEST



Modoel 328 tooled for marking conical surfaces of Fuse Insert Parts

Again NOBLEWEST Production Marking Machines *Speed-Mark* Vital Defense Products

Noblewest rapid production marking equipment is again meeting industry's challenge for better and faster marking. For example, Model 329 (illustrated at right), tooled for marking 20MM shells is capable of marking 4000 to 6000 per hour, depending upon the handling facilities. Leading manufacturers in many fields are saving time and money with these superior marking machines. Whatever you make—in metal, plastic, hard rubber—you too can mark it faster, better, at lower cost with Noblewest. Just write to Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.



A MARK IS ONLY AS GOOD AS THE DIE THAT MADE IT. Noblewest marking dies for the machines described above are made by master craftsmen to exacting standards that result in clearer impressions and longer life . . . the ideal dies and die holders for production marking equipment.

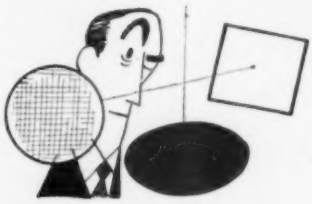
idea is really worth, and sometimes pay him a royalty, just as if he were an outside inventor; some just plain steal it. Of course, it is claimed that the inventor may have worked on company time or used company materials, or even, I guess, thought on company time, and this seems to be the basis for claiming the invention.

If the idea springs from a man's work in the plant and concerns the product he is making, there may be some justification for the company claiming prior rights to it, but even the honesty of this may be questioned. Certainly, if it has nothing to do with his work he should have the right to dispose of it as he wishes.

I believe this latter right has been upheld in the courts, but how many working men are able to take the case to court, fight it for several years and, win or lose, sacrifice their jobs for daring to sue the company?

This practice of making people sign away their rights to inventions is unjust and should be made illegal. It is alright to require a man to give his employer the first option to buy at a mutually agreeable price, but if they can't come to terms, he should be free to sell it where he wants.

Louis Hengerer
Providence, RI



Generally Speaking

Like many other engineers, I have sometimes been unable to arrive at given answers; occasionally because the answer given was in error, sometimes because my assumption or logic was in error. The latter is, of course, somewhat embarrassing but, at the risk of this, I would like to question an item in Talking Shop (*AM*—July 21 '52, p 139).

The amount of steel required to wrap 1 cu in. of space in 2 in. of steel will necessarily vary with the shape of the space. Assuming the space to be a sphere, the steel will also be a sphere and its volume will be 74.4 cu in. Assuming the space as a cube, and the steel wrapping to have a 2-in. radius on edges and corners, the volume of steel will be 83.1 cu in. For a cube with a cubical

"Tycol Afton keeps cutting edges cool... lengthens tool life between grinds"

Right! Tycol Afton Cutting Oil steps up tool performance . . . allows closer tolerances and finer finishes.

It makes fast, free cuts possible—reduces spoilage and the need for frequent regrinding.

Tycol Afton is a "dual purpose" oil, used for both cutting *AND* machine lubrication. Several grades are available for use on any specific machine tool.

For complete information, call or wire your nearest Tide Water Associated office today.

TYCOL

INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh
Philadelphia • Chicago • Detroit
Tulsa • Cleveland • San Francisco

TIDE WATER ASSOCIATED OIL COMPANY

17 BATTERY PLACE NEW YORK 4, N.Y.

SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"

taps won't break...

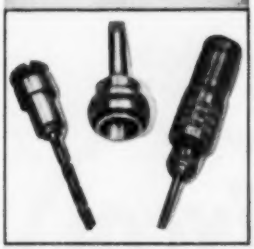
...Wickman Combination Tapping Attachment

- Applies Safe Torques ALWAYS
- Saves Taps, Labor, Materials

Here's an effective remedy for tapping headaches—a positive, safe tapping attachment with an entirely new clutch principle. This tapper guarantees your taps against breakage because it replaces coiled springs with a resilient material 100 times more effective than steel.

The Wickman Combination Tapper safeguards taps even in blind hole tapping; high resiliency of the pressure unit permits the clutch to slip the instant the tap strikes bottom or a hard spot. And, it's simple, too! Definite torque settings for given taps and tap sizes, without regard to materials being tapped, can be changed instantly without tools.

Wickman Tappers can be used on all reversible machines for horizontal or vertical tapping, blind or through holes. Three sizes are available: T-1, ½"-1¾" USS; T-2, ⅜"-1¼" USS; T-3, ¾6"-½" USF.



NOW—IMPROVED DESIGN GIVES NEW VERSATILITY, FASTER CHANGE-OVER

New features on improved model include a new detachable tapper shank holder with quick change lock for tapper or drill adapter. Change-over from tapping to drilling, counterboring, reaming etc. is made in a few seconds. No tools necessary. Send for free bulletin for full details.

THE Wickman MANUFACTURING CO.

15523 WOODROW WILSON AVE. • DETROIT 3, MICHIGAN

wrapping, the volume will be 124 cu in.

The density of steels will vary somewhat but, assuming 0.287 lb per cu in., the weights would be 21.4, 23.8, and 35.6 lb respectively.

Frank L Robertson
Eng Research & Dev'pt Lab
Fort Belvoir, Va

That's what comes of taking things for granted. The original figure of 31 lb was given to us by an Ordnance officer and we just went ahead and assumed it was correct. Indeed, it probably was correct for the particular shape he had in mind, because the weights vary from 21 to 36 between a sphere and a cube. Perhaps the figure was arrived at by dividing the total weight of a tank (model unknown) by the number of cu in. of enclosed space and coming up with a figure of 31 lb per cu in. All of which goes to show that all generalizations are dangerous—including this one.—Ed.

Not Guilty

In Talking Shop (*AM*—Oct 13 '52, p 181) you told about a company giving piano lessons to a girl because she had perfect dexterity. I think you did a disservice to management in publishing this. The first thing you know, employees will start demanding free lessons in everything they fancy.

I have a 10-man shop, and one man has a very good voice. In fact, he has been told several times that he ought to study for opera. Now, how do you suppose I can afford to give him singing lessons? And why should I? If he wants to learn to sing properly, let him pay for his own lessons.

For a magazine that is supposed to be for metalworking executives, you certainly lean heavily in favor of labor when you put such ideas in their heads.

George Svenson
Minneapolis

We did not advocate this practice. We merely reported it as an extremely interesting example of really enlightened industrial relations.—Ed.

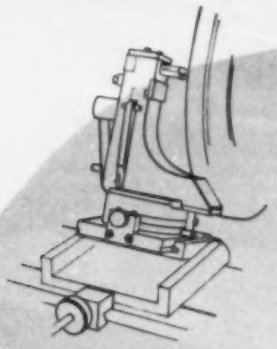
High-Carbon, High-Chrome Construction

.0001" ACCURACY

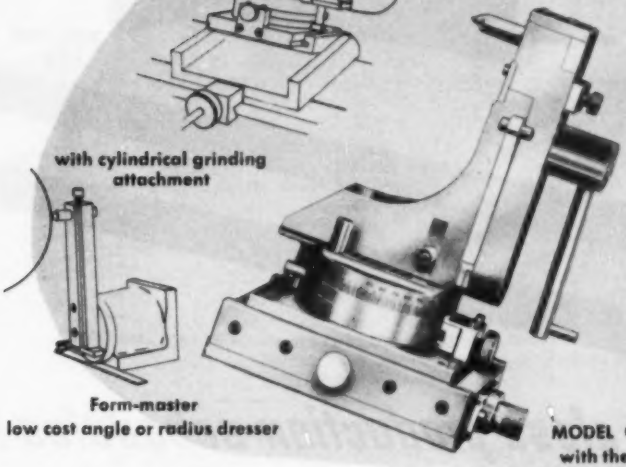
Fluidmotion

WHEEL DRESSERS

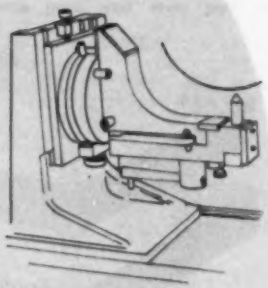
dress two angles tangent to a radius in one continuous motion



with cylindrical grinding attachment

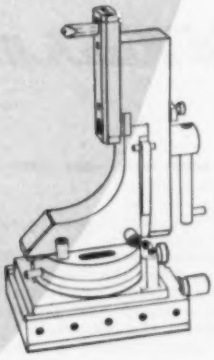


Form-master
low cost angle or radius dresser



with under wheel attachment

MODEL C
with the
micrometer feed



Model HC-36
for wheels up to
36" diameter

ADAPTABLE TO ALL TYPES OF CYLINDRICAL AND SURFACE GRINDERS

With the "Fluidmotion" Dresser, you can dress two angles tangent to a radius—using one handle in one continuous motion. Operation is so fast and simple that beginners can use them to boost your grinding machine out-put. Forms are always clean, precise—angles and radii "flow" into each other. Contours are consistently sharp, accurate to .0001", without tool or chatter marks.

J & S TOOL CO., INC.
479 Main Street, East Orange, N. J.

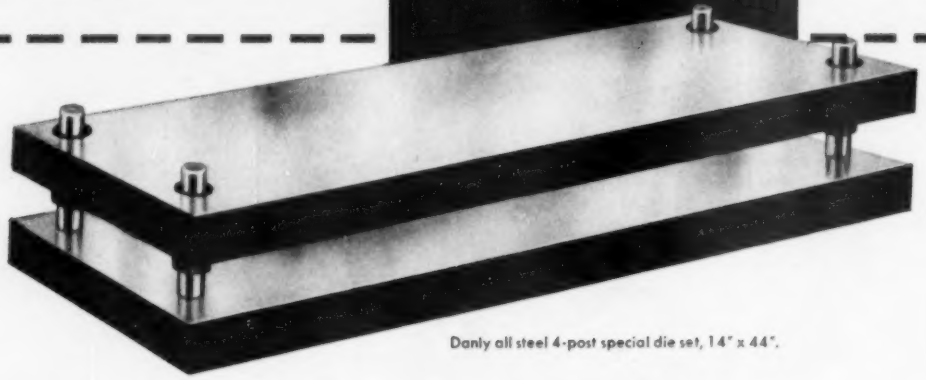
New home of J & S Tool Co., Inc.

J&S TOOL CO. INC.

A variety of models and attachments to suit your needs. Write for free catalog covering dressers in detail. J & S also manufactures a complete line of All-Purpose Jaw (machine) Clamps, Vises, and Special Tools. Write for Machine Shop "Time Savers" booklet.

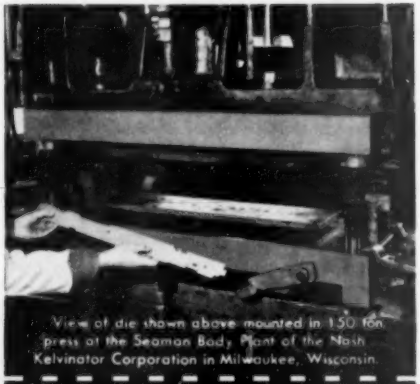
DANLY SPECIAL DIE SETS

Completed die for blanking a Nash door component—built for longer die life in a Danly all steel 4-post special die set.



Danly all steel 4-post special die set, 14" x 44".

help Nash meet close production schedules!



View of die shown above mounted in 150 ton press at the Seaman Body Plant of the Nash Kelvinator Corporation in Milwaukee, Wisconsin.

Dies play a big part in modern high-speed automobile production. They have to be ready on time when model changes are scheduled and they have to stand up under three-shift operation day in and day out with a minimum of down time. That's why you'll find so many Nash production dies built in Danly Special Die Sets. A Danly set means fast delivery to meet the tooling schedule and a rugged, precise base for the dies that assures maximum die life.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT —CALL YOUR NEAREST DANLY BRANCH

*CHICAGO	50	2100 South Laramie Avenue
*CLEVELAND	14	1550 East 33rd Street
*DAYTON	7	3196 Delphos Avenue
*DETROIT	16	1549 Temple Avenue
*GRAND RAPIDS		113 Michigan Street N.W.
INDIANAPOLIS	4	5 West 10th Street
*LONG ISLAND CITY	1	47-28 37th Street
*LOS ANGELES	54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE	2	111 East Wisconsin Avenue
*PHILADELPHIA	40	511 W. Courtland Street
*ROCHESTER	6	33 Rutter Street

*Indicates complete stock

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

SPOT NEWS of Metalworking

- **Plate glass will be ground on both sides at the same time** by a new machine to be installed by Libby-Owens-Ford Glass Co in a new 500-ft plant at Rossford, O. The multimillion-dollar construction will produce glass to new high tolerances on parallelism and thickness. Glass production will be continuous to a cutoff machine, from which the glass will go to conventional polishing setups.

- **Communist China is looking for British machines and capital goods** to the tune of ten million pounds sterling. After Moscow Conference last April, four million in goods has already been ordered. Chinese point out Britain has traditional market in China, and engineers there are familiar with their products.

- **Better wear in rubber materials is probable** with new DuPont Hypalon S-2, which resists attack by ozone, one important cause of cracks in automotive tires. Material has been blended with regular auto-tire rubber, 1 to 3, for tests. Byproduct advantage is flexibility at low temperatures.

Moving-coil clutch developed by National Bureau of Standards works like loudspeaker moving coil, has quick action required for instruments, computers, and telephone switching systems. Best applications will be where light loads must be accelerated rapidly—200 to 300 microseconds. Similar principle has been applied to advancing photographic film.

- **US aid, technological and economic, will help European manufacturers of electrical cable** give US makers stiff competition, as in machine-tool industry. Best recent example is French-built cable for Sweden capable of carrying 380,000-volt current in oil-filled housing. Probable future sales areas are South America, and US later.

- **Bearing surfaces on auto-chassis parts are protected** by phosphate-coating process being used in England by Leyland Motors. Surfaces are converted to non-metallic absorptive phosphate, which is hard, retains oil film for long period, and eliminates metal-to-metal contact. Wearing qualities of shafts and king-pin thrust buttons are extended this way.

- **Railway-mounted gas-turbine power plant** will be made by Westinghouse for Army Corps of Engineers as a mobile power-generator for advanced devastated areas. Two nonpowered cars will carry diesel turbine, gear reducer, generator, generator exciter, starting motor for turbine, transformer, auxiliary generators, and switchgear.

Machinability techniques applied to heat-treated alloy-steel parts at one plant have reduced cutting cycles as much as 60%. Indications are that machinability is more important than blanket application of carbide tools, which can sometimes be beaten on some jobs by ordinary HSS and Tantung.

- **Hydraulic forging press to handle 500,000 ton load** will be required by Air Force to make larger wing and bulkhead elements for jet planes now in design stage. Pressure to form aluminum alloys at forging temperature is around 26,000 psi; large areas extend total force required to astronomical proportions.

- **Tool explosions have occured at 3000 psi with Guerin rubber-die process.** Aircraft industry will pass this barrier with new forging-forming presses that will handle ½-in.-thick plate aluminum with 15,000-psi pressure.

- **Auto workers and others under escalator wage clauses are due for a cut in pay** as of December 1. Drop will be a cent if consumers price index doesn't rise a full point, and may be two cents if it drops slightly. Result will probably be increased UAW-CIO pressure to get 21¢ of cost-of-living bonus frozen into permanent rate.

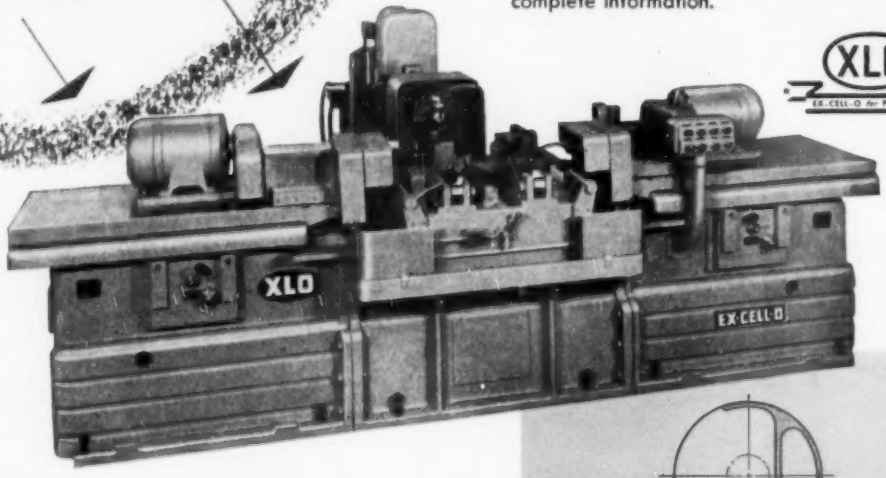
SAVE TIME, INCREASE PRODUCTION

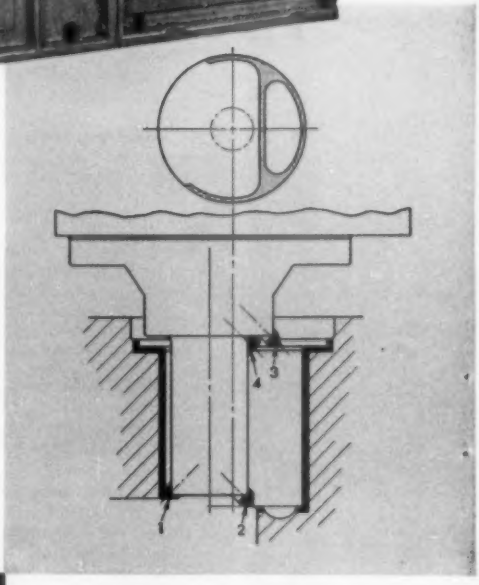
with EX-CELL-O WAY MACHINES

Ex-Cell-O Way Machines save time by working from 2, 3, or 4 directions simultaneously, holding accurate relationship between the various operations. Standard, self-contained way units can be rearranged for different work, using units individually or combined with others.

This Three-Way Precision Boring Machine uses three standard way units. The two side units perform conventional boring, plunge-facing and chamfering operations on holes approximately 3 inches in diameter. The rear station performs more complicated work requiring a cross-feed head (see drawing). The bore diameter at the rear station is 4 inches, and is held to limits of plus or minus .0005".

Ask your Ex-Cell-O representative for complete information.





Right: Tool layout for roughing operations at the rear station. Tool 1 bores the hole as the table feeds forward to a positive stop. Then the cross-feed head moves across while tool 2 faces an area at the base of the bore and tool 3 faces the shoulder of the counterbore. As the cross-feed slide approaches the end of its stroke tool 4 chamfers the edge of the bore. The table then reverses in feed until tool 2 blends its cut with the bore produced by tool 1, and tool 3 bores the counterbore, after which both table and cross-feed head return to the start position. The upper drawing is a view looking into the hole. The circle in broken lines shows the path of tool 2 while tool 1 is boring. The shaded portion is the area faced by tool 2.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • DAIRY EQUIPMENT
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS

52-27

Washington

Business next year will be good. That's still Washington's feeling as expressed by Agriculture Dep't experts at their annual outlook conference. Here's why:

Defense spending will continue to climb through next summer, providing the economy with a major prop. Business spending for plant and equipment could, of course, drop as the defense expansion tapers off; but increases in consumer buying and outlays by state and local government will partly compensate.

• • •

Military spending will rise $5 to $10 billion to a peak annual rate of $55 to $60 billion. Local governments will push up budgets for public works by $2 billion.

Housing will be strong, with starts hitting a level somewhere near this year's probable total of 1 million. Consumer buying is expected to rise $8 to $10 billion.

Employment is due to expand by an amount equal to the annual growth of the labor force.

Wage rates will increase by as much as five cents an hour. Prices will hold steady, though firm.

• • •

Capital spending is the area that worries government forecasters most. Once the last of the defense-related facilities is put in place, some time late next year, volume could drop by 15%. Offsetting this, however, will be an upsurge in commercial building as materials restrictions are dropped.

• • •

After 1953? No recession is predicted, but economists don't rule out the possibility. In fact, they look for a "testing" or "period of adjustment" of some proportions.

• • •

Defense contracting still climbs. Since July 1 (start of fiscal 1953), the Pentagon has placed contracts totaling about $18 billion, up about a billion over the same period last year. One reason it wasn't higher was the steel strike. The military let contracts for slightly more than $3 billion in July. The figure climbed back to $5 billion in August, and has averaged about that since.

• • •

But defense spending has been slower. Pentagon figures on spending about $52-billion during this fiscal year. It will be at an even rate—about $4 billion a month through the spring, then it will climb slightly.

• • •

Look for more flying saucers this month. Air Force's research branch is starting a new upper-air research project. They will use 100-ft helium-inflated plastic ballons to explore weather conditions between 50,000 and 100,000 ft. The thick plastic bag frequently breaks at high altitudes, and segments fall away as stiff plastic chunks, frequently resembling saucers. The plastic becomes pliable when it falls into warmer air temperatures. Air Force code name for the nation-wide project is Moby Dick.

• • •

Army will soon unveil a new version of the amphibious tractor. Latest type now being tested by the transportation corps is a 60-ton monster that will be used to unload ships standing offshore and to deliver supplies well up on the beach. Purpose is to prevent heavy casualties such as encountered at Okinawa and Tarawa when landing craft got hung up on reefs and exposed beaches at low tide.

• • •

Backwash of the summer steel strike is beginning to catch up with many makers of civilian products. They're telling NPA they'll slow down production by year's end unless they get beefed-up steel allotments for December or January delivery. NPA offers some hope for supplemental allotments, but points out that 10 million of the 22 million tons of mill products to be produced in the first quarter will be needed to fill fourth-quarter carry-over.

• • •

Some wage decontrol can be expected soon, but not on wage rates. The Wage Stabilization Board is planning to lift controls on minor fringe benefits like pay while on jury duty or when attending funerals. More leaway will be allowed, too, on more costly fringes like severance pay, paid holidays, and vacations.

Wage rates will be held, as much as possible, to level about 5¢ above rise in cost of living. That's the outlook until April 30.

A new push for higher wages next summer is already being planned by labor-union economists. The stabilizers in government expect it. A tighter labor market will help the wage drive. Union argument will be the need for greater consumer purchasing power to build market for increased output of consumer goods.

Philip Murray will likely lead the new wage drive in basic steel. His CIO contract opens up on wages on July 1.

• • •

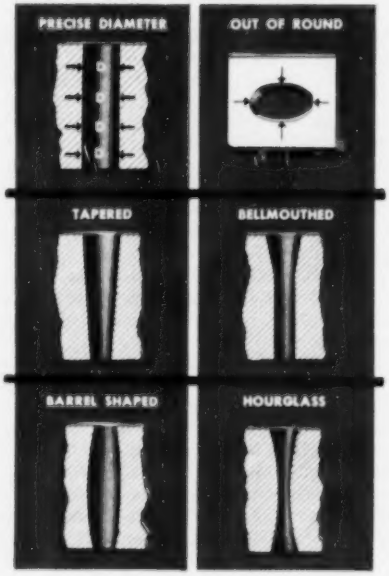
Aircraft companies refusing to employ "security risks" have backing from the National Labor Relations Board. NLRB absolved four plane manufacturers of charges that they were discriminating against good union men.

Precisionaire Spindles

SHOW YOU WHAT PLUG GAGES CAN'T

—and wear 10 to more than 100 times longer!

A PRECISIONAIRE STANDARD SPINDLE SHOWS WHETHER A HOLE IS:



A Precisionaire and *standard* spindle shows you instantly whether a hole is dimensionally O.K.—and, if not, *what* the error is, *where* it is, and *how* much.

Precisionaire spindles prevent accepting bad parts in Receiving Inspection. In Production Inspection they show when and how to adjust a machine *before* scrap is produced. They prevent passing incorrect parts in Final Inspection.

Other Precisionaire spindles and fixtures for single and multiple gaging of internal and external diameters, squareness, concentricity, center distance, etc., are readily available.

A PLUG GAGE SHOWS YOU ONLY

Whether the hole being checked will assemble with a mating shaft of known diameter—it cannot measure any condition shown at the left.

Stock Delivery on Precisionaires—4 weeks delivery on Standard Spindles and Master Settings Rings Sizes .125 to 4.000". See your Sheffield Representative or write for new Precisionaire Catalog.

4947

the *Sheffield* CORPORATION

Detroit

The large spending for ordnance vehicles has been completed. About $1-billion was allocated for facilities, including plants and tooling; probably about 85% of that has been spent.

After the rest is spent—during the next 6 months—the only large facilities contracts will be those for new models, like a successor to the T-48 tank which, between now and next May, will be phasing in to replace the M-47. Incidentally, about 70% of all tank facilities are now complete.

• • •

Tooling and other facilities for the new Buick V-8 engine have been progressing much better than expected in the past several weeks. One outcome: Buick expects to be able to build considerably more of the new class engines than it expected earlier. The result of that: The new engine will probably go into the Super series as well as the Roadmaster for 1953.

• • •

Index for building a completely new auto body: DeSoto (which did so for 1953) reported replacement or large alteration of more than 1,200 tools, machines, and fixtures.

• • •

Chrysler Div is changing its mind on horsepower—unwillingly. It decided to stay at 180 hp on its V-8 FirePower engine, but when Lincoln announced 205 hp for 1953 and Cadillac and Buick both made motions toward that rarified area, Chrysler listened to its sales department and reordered. Revisions will delay the higher-horsepower engine till the turn of the year.

The 1953 Chrysler models, announced late in October, have restyled bodies, lower and softer than heretofore; a 119-hp rating on the Spitfire engine (for Windsor series); and a 12-volt electrical system for the heavier loads ahead, including air-conditioning, which will be announced in the spring.

The horsepower race, incidentally, has all autodom worried. The fears: More accidents; critical newspaper editorials; maybe Congressional rumblings. The probable solution: Agreement among the manufacturers not to advertise horsepower any more.

• • •

Precision manufacture of automobile engines, says Olds, is paying off in extended service life. One example: A fleet of seven Oldsmobiles which have averaged more than 162,000 miles does not yet require major engine overhauls. Olds credits this to high-compression-design efficiency, precision manufacturing of its Rocket engines.

• • •

Dodge is setting up a complete production-control metallurgical laboratory at San Leandro (Calif) plant. It will be equipped not only for metal, but also for rubber analysis and more general chemistry.

GM's dual-purpose plant at Arlington, Tex, will start off single-purpose—the Navy has washed out plans for building Grumman-designed aircraft there. One result: Faster start on Buick, Olds, and Pontiac at Arlington — more employment sooner.

• • •

Production rose at the end of October to the best weekly figure in some time: 145,057 cars and trucks, U S and Canadian plants included. The outlook is for continuing volume around that level for some few weeks.

The first 1953 quarter is a question mark. Steel allocations are low—half today's output rate. Detroit expects the miserly amount of tickets to expand somewhat, but precisely how far is anyone's guess.

• • •

Willys-Overland plans an assembly plant at Sao Paulo, Brazil, for jeeps, station wagons, trucks, and passenger cars. Willys now assembles in Belgium, Ireland, The Netherlands, Denmark, India, South Africa, Indonesia, Mexico, and Australia.

Farm-implement note: Detroit suppliers say that the tractor and implement people, having built to maximum in recent past years, are turning a bit cautious. This winter they'll build against orders, not expectations. But they figure business will be good—crops were profitable.

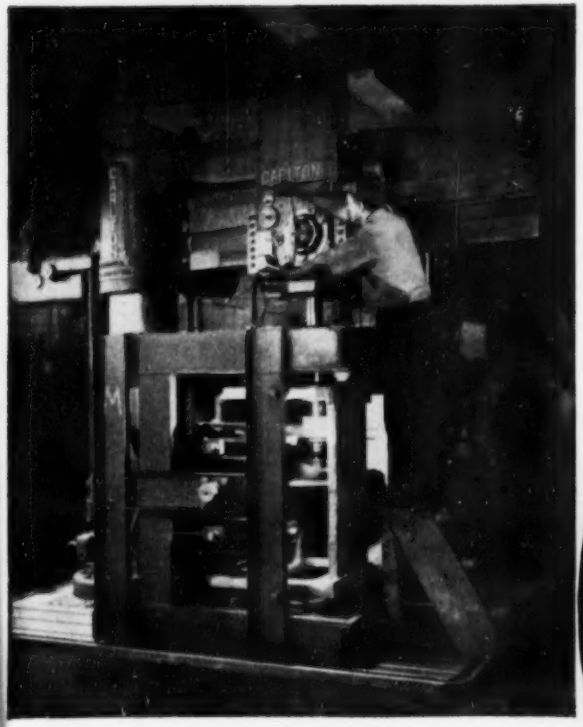
• • •

Can I be an engineer? That's the title of a book General Motors is distributing to educational circles with the idea of attracting students to the technical fields. The book defines engineering, tells why engineering should be studied, describes opportunities, outlines hallmarks of engineering people, suggests courses of study.

• • •

The whole automotive industry—suppliers as well as car and truck makers, tooling sources as well as equipment makers—is waiting for word on what will happen to the demands made by the CIO United Auto Workers Union. UAW, it will be recalled, asked for transfer of most of the living-cost bonus into permanent base rates, higher pensions, and an increase in annual raises from 4¢ to 5¢.

UAW hasn't done much beyond file these demands with the major companies. Detailing and arguing have waited on the election. Now that election is over, labor may be more troublesome—and if a storm brews up, everybody will certainly get wet.



Carlton customers

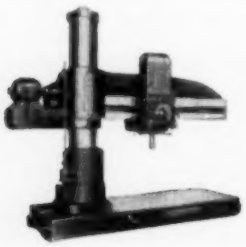
GET HOLE DRILLING EFFICIENCY AND ECONOMY!

CARLTON RADIAL DRILLS provide generous capacity and tremendous power, yet are extremely accurate. Miller Printing Machinery Co., Pittsburgh, says:

"When compared to the ordinary drill, this huge Carlton radial (above) is gigantic and yet it is precise and accurate."

THAT PRECISION COMES FROM enlightened Carlton designing, engineering and manufacturing . . . and from an intimate knowledge of your radial drill requirements acquired in sixty years of experience.

Be sure to check Carlton before you buy your next radial drill. Ask for descriptive bulletins today.



Carlton

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.

Machine Tools

U.S. and certain foreign machine tool builders have been talking over the possibility of cooperating more closely.

One American builder has concluded an agreement with a French builder to have his machines assembled in the latter's plant. He has given the French company the exclusive selling rights for his product in western Europe and in the British Isles.

Another U.S. company has been discussing a cross-licensing arrangement with a French builder. The latter may produce in France a heavy-type machine of U.S. design as a result.

• • •

A swiss manufacturer is likely to begin making within the next year a certain US machine under a licensing agreement.

These decisions are being made by American builders who are convinced that their best bet for competing in the European market is to have their machines manufactured in Europe.

• • •

Europeans would like to have their machines produced over here. There is the case of a French builder who is conferring with a US company with the idea that the latter make its semi-production type of machine in this country. Still another French company plans to seek a manufacturing outlet for its machine tools in America.

A German machine tool builder with a successful hydraulic unit has been trying to interest US builders in adopting it.

• • •

Foreign machine tools still are comnig into this country at a lively clip. A prominent automobile maker is reported to have bought some 90-100 Italian machines the past few weeks for a new defense project. Delivery is said to have been the chief deciding factor.

This month a French builder of radial drills will complete shipment of an order for 170 units to the Chevrolet factory at Tonawanda, N. Y. The builder says that the entire lot have been delivered on time.

• • •

British tooling program for defense production will be 90% completed by next spring. Most of the US machine tools will have been delivered and will be at work then.

This fact is of major importance to many machine tool builders in various European countries. These builders had huge British orders dumped in their laps late in 1950 and early in '51.

The question is: Where will these builders get orders to take the place of the British business, which now is nearing an end?

It is impossible to name a cut-off date for the British program, however. The British obviously will be altering, extending and otherwise reshaping their requirements from week to week; and new machine tools will have to be ordered as the program develops further.

This means that the British defense program as a source of machine tool business will not end abruptly but will go on indefinitely.

But the big push will be over the first half of '53.

Donald M. Pattison, vice president of sales of the Warner & Swasey Co., is taking over as administrator of the Metalworking Equipment Division of National Production Authority. He is already in Washington, after having visited the Hanover and Olympia shows.

He succeeds Ralph S. Howe, executive vice president of the New Britain Machine Co., who has been head of the division since he took over from Swan E. Bergstrom last spring. Mr. Howe will return to New Britain after a well-earned vacation.

Lately Mr. Howe has been spending much time preparing a detailed report on the machine tool industry for the Vance Committee.

• • •

The Vance Committee soon will issue a big report and then is likely to call it a day. Thus far it has produced only a preliminary report.

General belief of the committee is well known, of course. It is committed to the theme of creating more productive capacity for armament production to be used in case of emergency. And it believes in building a reasonable number of long lead-time machine tools (the elephants) now rather than waiting until an emergency hits the nation.

• • •

Builders behind the iron curtain would like to sell in Europe if they could. Not long ago a Czech machine tool builder visited Switzerland in search of orders.

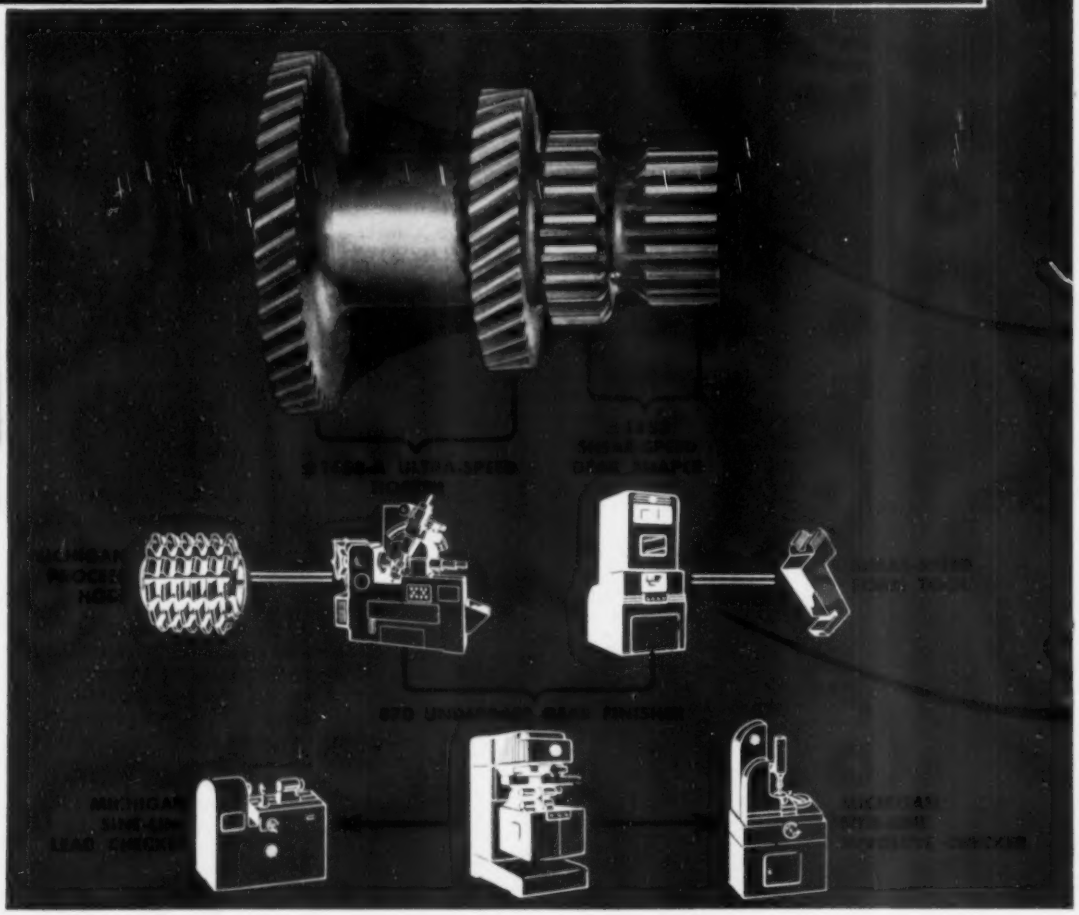
Official attitude of U.S. government is said to be about like this: If the Communist countries want to sell to the western world, that's fine.

Every piece of capital equipment made behind the iron curtain and delivered for use to the West helps to weaken the total strength of the Communists, as measured in economic resources.

Any movement of machine tools from the Russian sphere of influence westward will be only a trickle at best, however. The Czechs are reported to be shipping the bulk of their output into Russia and into other satellite nations.

BF

40 teeth 8 DP 5¼" P.D. ⅞" face	31 teeth 8 DP 4⅛" P.D. 1" face	21 teeth 7/9 pitch 3" P.D. 1" face	17 teeth 7/9 pitch 2⅓" P.D. 1¼" face	(as shown below) **gear**	
81 seconds	67 seconds	38 seconds	48 seconds	Estimated cutting time	**cutting**
32/hr.	37/hr.	56/hr.	48/hr.	Gears / hr. at 85% eff. per machine	
60 seconds	50 seconds	48 seconds	45 seconds	Estimated cutting time	**finishing**
41/hr.	47/hr.	48/hr.	51/hr.	Gears / hr. at 85% eff. per machine	



YOU CAN GET PRODUCTION LIKE THIS

ON GEARS LIKE THESE

TOOLED WITH THESE MACHINES

THE TIME TO PLAN YOUR GEAR PRODUCTION....

The best gears are produced at the lowest cost when (a) each production step is tooled for maximum efficiency and (b) all steps of the line are properly "coordinated"—from blank to finished gear.

That is where Michigan Tool Company comes in.

That is why we have developed so complete a line of gear production equipment—machines and tools for practically every step, including gear cutting, finishing and control of quality.

We would like to help you improve your "line coordination," help you cut costs and rejects, increase output per machine and man hour, improve quality.

An invitation from you to have one of our engineers visit your plant and discuss your plans and problems with you will be appreciated.

May we hear from you?

MICHIGAN TOOL Company

from blank to finished gear

DETROIT 12, MICHIGAN, U. S. A.

Cut any metal, any way BETTER, FASTER, AT LOWER COST

The examples* below show how Texaco Cutting Coolants – backed by the know-how of Texaco Lubrication Engineers – can help you do all your machining –

BETTER – On this drilling job, a .040" hole had to be reamed and held to plus or minus .0002". Change from a competitive oil to *Texaco Cleartex Cutting Oil* reduced rejects 30%.

FASTER – In the production of a slotted part on a Davenport 5-spindle automatic, the better cooling and lubrication provided by the recommended Texaco Cutting Fluid resulted in an increase of 875 pieces per 8-hour shift.

AT LOWER COST – Reduction in downtime, after switching to *Texaco Sultex Cutting Oil*, saved $245 a month – on just one machine.

Similarly, where machines are hydraulically operated or controlled, you can reduce costs and assure increased production by using *Texaco Regal Oil (R&O)* as your hydraulic medium. It's turbine-quality – specially fortified and processed to prevent sludge, rust and foam.

Let a Texaco Lubrication Engineer, specializing in metal working, help you step up production and reduce your machining costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

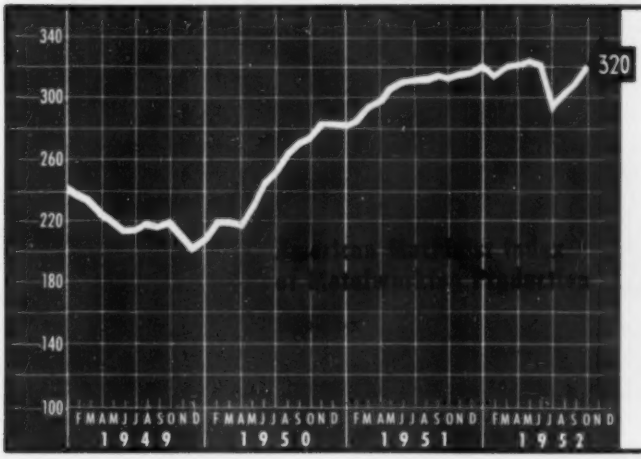
*Names and details on request

TEXACO CUTTING, GRINDING AND SOLUBLE OILS FOR FASTER MACHINING

Faithfully yours 50 for Fifty Years

TUNE IN: Tuesday nights on television – the TEXACO STAR THEATER starring MILTON BERLE. See newspaper for time and station.

Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	OCT '52(*)	SEPT '52(p)	AUG '52(r)	SEPT '51
	320	**317**	**303**	**308**
Total Index	320	317	303	308
Machinery	298	298	302	
Electrical Machinery	365	354	345	
Autos	202	172	224	
Other Transportation	556	551	457	
Other Metalworking	314	302	308	

(*)Estimated (p)preliminary (r)revised

Steel is still producing at the highest rate in history, but isn't making much of a gain over demand. Scrap and pig, too, are in good supply, and bar stock is being produced to put that phase of steel in fairly good shape.

A minimum of complaints about steel supplies are being registered now, particularly in the far West. Big bars, heavy plate, structural sections, and tubes are still not too plentiful.

A future pinch in steel may be felt in about a month —result of low allocations just released.

• • •

Tool and die shops are holding up well, with business at a high level and not erratic, particularly where defense orders are placed. Big trouble in these shops is skilled help.

• • •

Press building is booming, and looks like it will be busy unusually for at least six months ahead. Main problem here is trying to squeeze in a few presses for civilian orders, as defense program is taking almost all the output.

• • •

New products are getting spotlight treatment in most industries, even though most of metalworking, particularly the consumer-goods and appliance lines, is averaging high activity. A trend toward diversification is developing in many industries that have relied in the last few years on military contracts.

New designs and new lines mean more engineers, so college graduates should continue to find many openings, even as defense business slacks off. Considerable thought is being put on what products can be developed to sell after the defense boom.

Unions are trying to break wage stabilization by demanding 20 to 25 cents more than WSB will allow. Where they can get companies to agree to submit these demands to WSB, unions can shift part of the blame for the pressure onto employers.

• • •

Railroad-equipment builders are reporting cutbacks in orders, resulting in layoffs and reduced work schedules—attributed to delayed reaction to the steel strike of last summer.

Drops in zinc and lead prices may cause some mine closings. Demand for copper is still up; shipments in September were almost 123,000 tons, compared to 119,000 in August.

• • •

Magnesium production is also up, 3% in primary ingots, and 4% in castings. Castings rate is 19% over a year ago, and is expected to increase. Wrought magnesium dropped a bit from last year, and shipments will probably not be much higher by the end of the year.

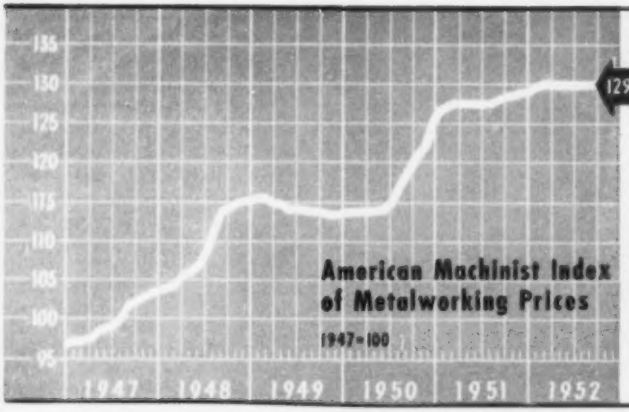
Gear index is up 8.4%, September over August. This is figured on the new base (1947-49 = 100), and now stands at 143.4.

• • •

The drop-forging industry is expecting an easing of new orders, although the present backlog is up over last year's, and production this year will beat last year's.

Stampers are taking more orders than last month, and better steel supplies point toward higher production ahead, not necessarily depending on the auto industry. Only worry point is trend of customers toward installing their own presses.

Gaging Business



PRICE INDEX

	OCT '52(*)	SEPT '52(p)	AUG '52(r)	SEPT '51
	129.7	**129.6**	**129.6**	**128.2**
Metalworking Machinery	137.9	137.9	134.2	
Other Machinery exc. Electrical	132.2	132.2	132.2	
Electrical Machinery	124.7	124.7	127.1	
Fabricated Metal Products	128.0	128.0	125.3	

(*)Estimated (p)preliminary (r)revised

Industrial output is about 3% higher than it was last year, due mostly to durable-goods manufacturing. Manufacturing plans for expansion next year are on the downgrade, but increased expenditures by utility, trade, and service industries may largely offset this drop.

• • •

Government spending will be level or slightly higher next year. DPA reports that expanded facilities for defense production covered by fast tax writeoffs were 57% completed by the start of October. Electrical and non-electrical machinery programs reached the same point July 1.

Defense-procurement orders totalling $9.5 billion were let out in July and August, and the total for September and October will run a little higher—$10 billion. About $8.3 billion of the July-August contracts were for hard goods—aircraft, tanks, ships, weapons, electronics.

Retail trade is on the upswing. Consumer-goods output is at the highest level since mid-1951. The big rise recently is in consumer credit—up a billion in the past four months. Consumers are not paying on time, and may be getting too far and too fast into debt.

• • •

Factory workers averaged $69.58 paychecks in September, a record more than $4.00 above a year ago, and $2.70 up from last August. Hours worked averaged 41.3, which is about an hour more than during the last year.

Employment is up, too. Factories hired an additional 300,000 workers in September, bringing the total employed to 13.1 million.

• • •

Cost of living has declined for the first time in six months. It was a small dip, but it may indicate price trends for the rest of the year. Costs will probably be more stable.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	246.6	246.3	233.4
Steel ingot operation (thousands of tons)	2,221	2,211	2,057
Electric power output (million Kilowatt hours)	7,696	7,681	7,234
Production of automobiles and trucks	145,057	138,088	121,215
Engineering construction awards (*Eng. News-Record*—millions)	$260.3	$333.3	$189.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	226	225	218
Index of durable manufactures production (1935-1939 = 100)*	289	285	274
Durable goods manufacturers' sales, millions*	$10,622	$9,808	$10,314
Electrical machinery manufacturers' sales, millions*	$1,179	$1,106	$1,025
Other machinery manufacturers' sales, millions*	$1,895	$1,942	$1,731
Durable goods manufacturers' new orders, millions	$12,500e	$11,205	$11,032
Electrical machinery manufacturers' new orders, millions	$1,350e	$1,152	$1,064
General machinery manufacturers' new orders, millions	$2,150e	$2,043	$2,180

* Seasonally adjusted e Estimated

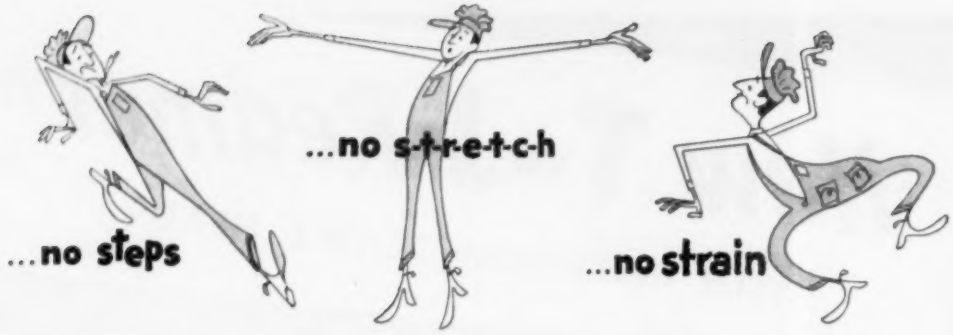
New T-J Reamer

WITH INTERCHANGEABLE HEADS

1. CUTS REPLACEMENT COST TO **LESS THAN HALF!**
2. QUICK CHANGE OF HEADS . . . **SAVES TIME!**
3. **EASY** TO CHANGE HEADS FOR **DIFFERENT METALS** . . . INCREASES EFFICIENCY!
4. WIDE RANGE OF SIZES . . . SPIRAL FLUTE

Another T-J *first!* New T-J Reamers designed with *one shank* quickly and easily interchanged with wide range of heads. Sizes range from ½" to 2¾" inclusive, in 1/16" increments . . . spiral flute. Head has tapered hole which insures concentricity and a snug fit on smoothly ground tapered shank. Reamer operates free from binding or sticking, due to cutting portion wearing undersize and creating negative relief. Performance retains all advantages of standard, expensive reamer. Backed by T-J's 36 years of know-how as one of largest manufacturers of die sinking milling cutters. Write for more details.

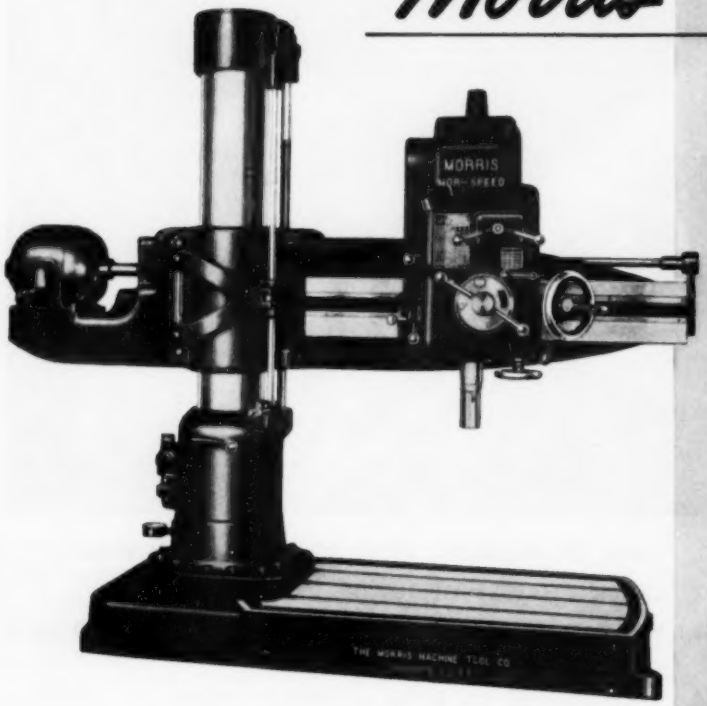
The Tomkins-Johnson Co. • Jackson, Michigan



drill....ream....tap....FASTER, EASIER!

Morris

MOR-SPEED RADIAL DRILLS



Designed to set a cost-killing pace in the race for profitable production, MORRIS Mor-Speed RADIAL DRILLS offer a long list of outstanding features:

- ★ Centralized Controls—Reduce time between cuts.
- ★ Variety of Speeds and Feeds—Better selection of the right combination for every job.
- ★ Automatic Lubrication — Saves wear, insures accuracy.
- ★ Greater Strength, Rigidity and Balance — Provide greater machining precision.
- ★ More Automatic Stops—Save time and reduce manual control.

If you're interested in removing metal faster, write for your copy of the new MORRIS Mor-Speed RADIAL DRILL catalog.

a better product at less cost with precision PLUS production

Morris

THE MORRIS MACHINE TOOL COMPANY, 933 HARRIET ST., CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

How Europe Looks at Apprenticeship

GENEVA, Switzerland—The amount of apprentice training being done in Europe's metalworking industries makes an indelible impression on a visitor.

I first became conscious of the emphasis on apprenticeship in visiting French plants, including machine-tool-building companies. One factory, with less than 300 workers, in a town far removed from Paris, had a dozen or more youngsters learning the machinist's trade.

IN GERMANY, I was shown apprentice programs in a number of metalworking shops. One company has an entire floor, with up-to-date equipment, devoted to its apprentices. A professional instructor is in charge.

Part of the apprentice's time is given over to classwork, for which a special room with school desks has been assigned. And the course runs four years. The boy who is graduated from this program is well on his way to becoming a skilled all-around machinist.

One German machine-tool-builder's apprentice activities especially struck me. Up to the end of the war, the builder was in what is now the Russian zone. After having escaped from behind the Iron Curtain, a year or two ago he reestablished himself in the American zone.

NOW HE IS employing about 400 men, only a fraction of the work force that he had formerly. Among today's employees, in somewhat makeshift quarters, is a sizable group of young apprentices. These youngsters have agreed to stay on for three years to learn the trade.

It is the same story in Switzerland, which was not touched directly by war. Management is thoroughly aware of the necessity for training an adequate supply of skilled men for the years ahead. The boys come in to the factory at the age of 16 to begin their special course. They are given lots of attention. They are in training for three or four years, the exact time varying with the individual company.

The government has nothing to do with these programs. In each case they are carried out at the expense of the manufacturer and solely upon his initiative.

THE REASON why he conducts apprentice training programs is that he is convinced that it pays off. He is not doing it for altruistic reasons, but for a selfish purpose, which benefits both himself and the trainees.

This interesting emphasis upon apprenticeship training in western Europe is worth study by metalworking companies back home in America.

I get the impression that the place of apprenticeship over here is much more important in the minds of management than it is in our own country. Yet our nation is more highly industrialized than Europe. And our need for good apprentices is even greater than it is here.

Perhaps it is time for management in America to take another look at apprenticeship and reappraise its program.

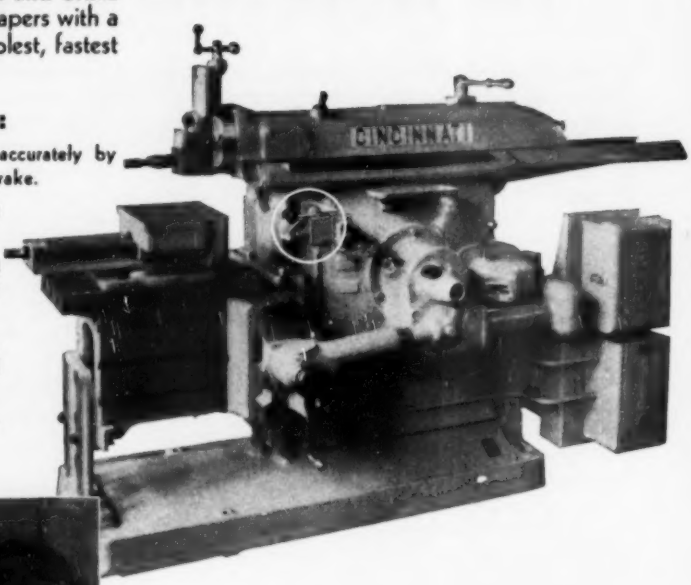
Burnham Finney

* Electro-Magnetic Clutch and Brake – another NEW on Cincinnati Shapers

Now, with one convenient control the new electro-magnetic clutch and brake start and stop Cincinnati Shapers with a finger touch. It is the simplest, fastest control on any shaper.

Important advantages:

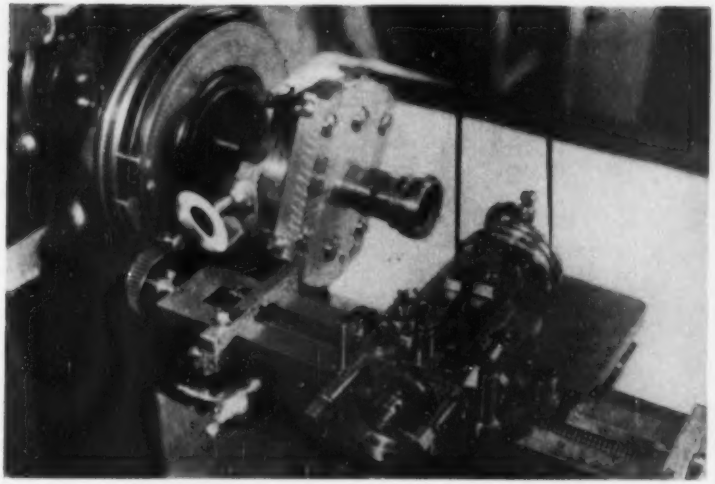
1. Ram is positioned quickly, accurately by instant action of clutch and brake.
2. Starting and stopping by just a light touch.
3. The single control lever is at the most convenient operator position.
4. Clutch and brake operate without grab . . . are powerful and smooth in action.
5. No adjustment of clutch or brake is required.



This clutch and brake are standard on all new Cincinnati Shapers. They are Warner units which have been thoroughly proven on machine tools.

Write for complete Cincinnati Shaper Catalog N-S

THE CINCINNATI SHAPER CO.
CINCINNATI 25, OHIO U.S.A.
SHAPERS · SHEARS · BRAKES

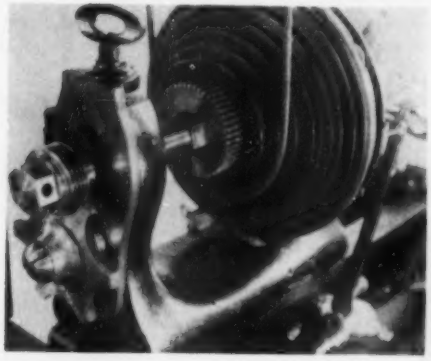


HOLTZAPFFEL ornamental turning lathe, built about 1827, with oval chuck carrying a collet-type spring chuck. Power-driven universal cutter is mounted in slide-rest. Two pointers in front of main pulley are self-counting device for index plate on pulley

Great Grandpa Did Contour Turning

More than 150 years ago, they had lathes that would do the most intricate profiling and contouring. Some of them are still in use — and are still accurate within tenths

By A V REED and NORMAN TWEDDLE



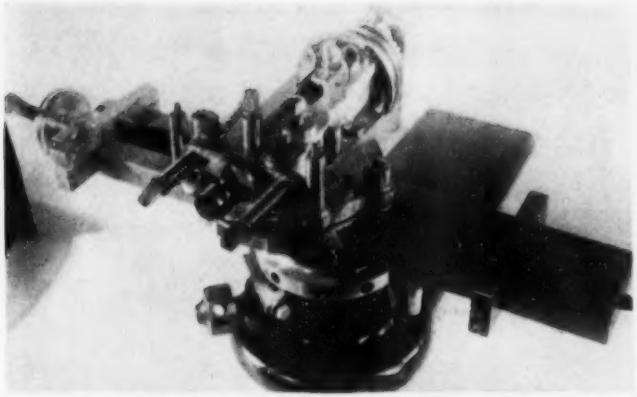
THREAD-CHASING DEVICE, showing master hob mounted on end of spindle, and star-shaped half nuts engaged by slide on headstock. In threading, the entire spindle moves back and forth in its bearings.

CONTOUR-TURNING lathes are currently achieving considerable popularity, and it is generally assumed that they represent a new development. Actually, they had their counterparts in the early days of machine tools. Although intended for use on wood and ivory, these early lathes were even more versatile and complex than those of today.

Known as Ornamental Turning Lathes, and Rose Engine Lathes, a number of these machines are still in use by members of a British society — The Society of Ornamental Turners — despite their 150-year age. They were, and still are, equipped with every conceivable device for complex work, including spherical slide-rests, elliptical slide-rests, rose chucks, geometric chucks, geometric slide-rests, curvilinear or duplicating slide-rests, oval chucks, and a host of other apparatus.

A typical machine, the Holtzapffel lathe, has a 10-in. swing, and 20 in. between centers. The hollow spindle is only 15/16 in. in dia, but is glass hard and runs in glass-hard steel bearings. In use since 1827, the spindle has worn only 0.0006 in. It is not known how these spindles were produced, but the difficulty of hardening a steel spindle 11 in. long and less than 1 in. in dia, and keeping it straight enough to lap into bearings 9 in. apart—without benefit of a cylindrical grinder—will be appreciated. The material is water-hardening cast steel.

For threading, the spindle is made to traverse through the bearings under the guidance of master hobs secured to the rear end engaging half-nuts



ORNAMENTAL SLIDE-REST has main slide 12 in. long, and cross-slide which swivels 360°. Entire slide-rest can be raised or lowered by large nut with tommy-bar holes to adjust tool to exact center of work. Stops are provided to main and cross slides

carried on a vertical slide fitted on the head-stock.

The thread chasers are used either in the slide-rest or by hand. The pitches are aliquot (equal) parts of the Strassburg inch, which is 1.05 in., English measurement. Thread angle varies with the pitch, and is from 55 to 60°.

Pulleys are grooved for round belts, and have a division plate with 8 rows of holes from 12 to 360 fixed to the front. Index points are adjustable for subdividing, and often have self-counting devices to obviate errors.

No Two Alike

Seldom are two of these old lathes alike in construction details; much depended on the purchaser's purse and personal ideas. Some have automatic feeds to the slide-rest, with ingenious trip gear; some have a slide-rest equipped with an elevating screw to raise or lower the whole rest and bring the tool to exact center height. The cross-slide also swivels through 360°.

Most parts of these old machines are made of brass, but all bearings, screws, and main slides are steel. Leadscrews are 10 tpi, and micrometer heads are fitted, reading to 0.005 in. The divisions are widely spaced, and it is easy to estimate a 0.001-in. cut. The bed is of iron, with a substantial mahogany frame carrying a treadle and overhead drive, although this has now been removed and a modern motor drive substituted.

Supplied with these lathes was a host of cutting instruments for, in modern parlance, drilling, universal milling, and cutting surface designs, ellipses, epicycloids and rose-engine designs. For the latter, the design may be produced by a follower operating on master cams, or may be generated by gearing and slides. Gear spindles are of hardened steel in hardened bearings, with double-taper thrusts. Lead screws for adjusting the cutters may be as small as ⅛ in. in dia, by 4-start, 10 tpi.

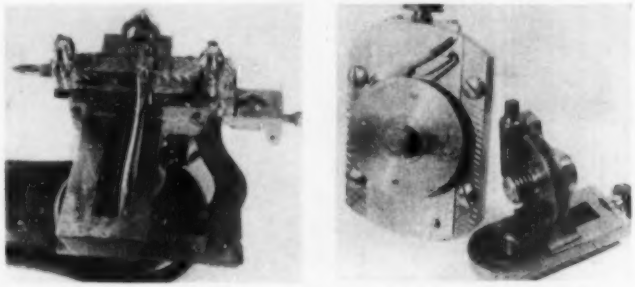
The intricate nature of the work precludes a finish other than that produced by the tool, so a comprehensive stoning and polishing outfit is provided for the cutting edges. A goniastat holds the tool at the correct angle, and the edge is stoned first with fine emery, then with a brass lap charged with fine Arkansas oilstone powder, and finally with an iron lap and rouge. For cutters with concave profiles, revolving Arkansas oilstones are used.

The Geometric Chuck

An instrument frequently used with these lathes is the geometric chuck — probably the most complicated piece of apparatus ever devised for use in a lathe. Originally developed in France as an instrument for drawing curves arising from the planetary motion of two circles, it was adapted to the lathe about the middle of the 18th century.

In its simplest form, that is, a single stage only, the chuck carries a replica of the spindle nose of the lathe, upon which the workpiece or a sheet of paper may be placed. This nose is driven by gearing to rotate either faster or slower than the spindle, and may be set off center. Thus, when a tool or pencil is brought into contact with the work, an epicycloid will be traced. The amplitude of the loop of this epicycloid depends on the eccentricity and the distance of the tool from the mean axis of the spindle. The number of loops depends on the ratio of rotation of the work and the spindle. According to the number of gears in the train, the loops of the design will be inside or outside the basic circle of revolution.

The next stage is to add one more part, making what is called a two-part chuck. The second part

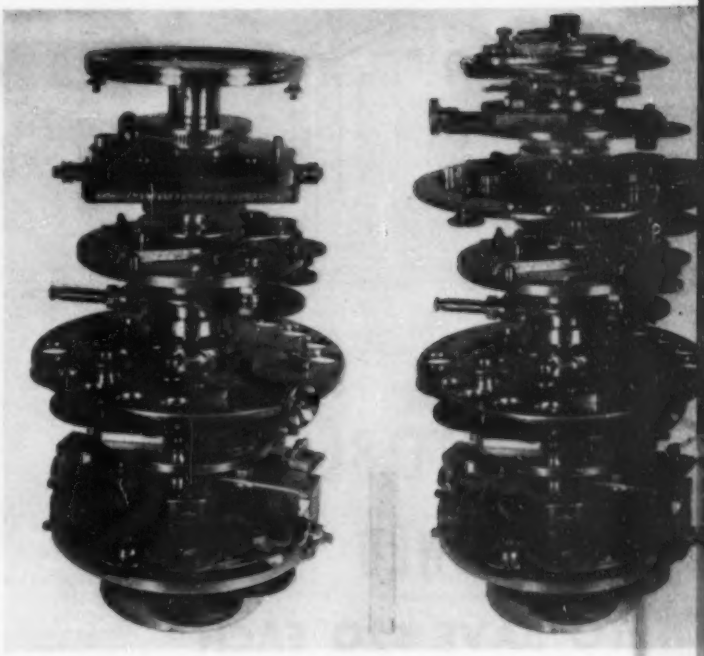


CURVILINEAR SLIDE-REST (left) with templet for turning and ornamenting curves. Dome chuck (center) screws on spindle and holds work at 90° to spindle axis. Work is usually rotated by worm and worm gear. Eccentric chuck (right) screws on spindle and has cross-slide adjustment

is exactly the same in principle as the first part so, when set in motion, a more involved figure is produced. To produce truly symmetrical figures from multipart chucks, a device must be added to give infinite adjustment to the angle formed between the eccentricities of one part and the next. This is usually done with a worm and wheel located between the sun gears of each part.

Additional stages can be added, but there are practical difficulties as to the number because the whole thing becomes unwieldy. A two-part chuck can be mounted horizontally, but three or more parts need to be mounted vertically because of the overhang.

An accompanying illustration shows a four-part and a seven-part chuck. Only three of the former are known to exist; one in the Science Museum, London; one in Scotland; and the third in the possession of one of the authors. The seven-part chuck is believed to be the only one in existence. Even with the simplest settings, a great deal of careful work is involved in getting any figure properly symmetrical. As many as 75 or more gears may be in mesh, and it can be set to give a ratio of over 30 million to one. At a spindle speed of 1 rpm, it would take about 60 years to perform one cycle.

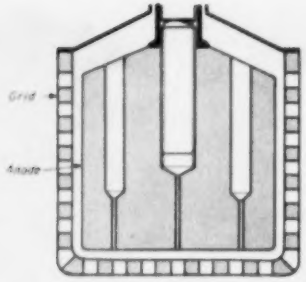


GEOMETRIC CHUCKS MADE IN THE EARLY 1800's. The four-part model (left) carries a platen for paper, and immediately blow this is an eccentric chuck which makes it possible to group and repeat a figure around a circle. The seven-part chuck (right), believed to be the only one in existence, can be set to give a ratio of 30 million to 1

SMALL IVORY CUP (left) 5¼ in. high, and 8½-in. clock case (center) produced entirely on ornamental lathe. Geometric patterns (right) made on a Rose engine built before 1800. Designs are one continuous cut with 5000-rpm diamond drill, using geometric chuck without use of a master design

These instruments were made chiefly by Holtzapffel & Co, and Evans & Fenn, both of London. It can be appreciated from the illustration how much labor is involved in getting the work face truly at right angles to the mean axis of the lathe. Yet, in the four-part chuck, the amount of error on the working face is only 0.0002 in., a remarkable performance considering it is about 100 years old.

For more detailed information on the geometric chuck, see, INDEX OF THE GEOMETRIC CHUCK, *by the late Sir Thos S Bazley, Bart;* GEOMETRIC TURNING, *by the late Rev H S Savory or The Society of Ornamental Turners, 35 Hoadly Road, London S W 16.*



Anodes and their control grids for mercury-arc rectifiers are machined from solid cylinders of high-purity graphite, using carbide-tipped tools in a 20-in. engine lathe

After facing and turning graphite block, special trepanning tool cuts groove between grid and anode blanks to within approx 1½ in. of bottom of block. Speed for 800-amp parts shown is 200 rpm; feed is about 2 ipm. Similar tools machine 400-amp parts

GRAPHITE BLOCKS TREPANNED TO SAVE $20 EACH

Anodes and grid baskets for mercury-arc rectifiers now come from one block instead of two . . . Ingenious tooling saves time and material

BY EDWARD WALKER, Tool Engineer
General Machinery Division
Allis-Chalmers Manufacturing Company

ANODES and grids for Allis-Chalmers 400-amp rectifier tubes and 800-amp rectifier tanks are machined from large solid cylinders of high-purity graphite, using specially designed carbide-tipped tools shaped to permit trepanning the anode slug from inside the grid basket with a minimum of waste. Design of these tools was complicated by the fact that only a ⅜-in. wide trepanning cut can be taken in separating the two parts.

Originally, the anode and its control grid (shield) were cut from separate carbon blocks, because the trepanning tools first employed to cut the center slug were too wide to permit making the anode from the slug. A considerable amount of expensive graphite was wasted each time a grid was made, obviously a considerable saving could be had if narrower tools were devised.

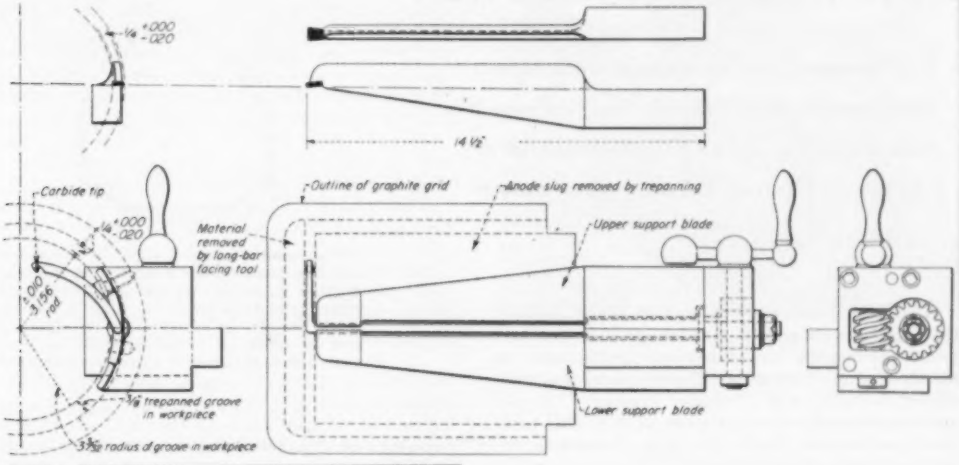
In the new setup, four carbide-tipped tools are mounted in an engine lathe for roughing grid baskets and anode blocks from the cylindrical graphite blanks. These are: (1) a conventional single-point facing and turning tool for operations on outside surfaces of the workpiece blank, (2) a trepanning tool with a special shank that enters the ⅜-in. wide groove the tool cuts longitudinally into the workpiece, (3) an unusual cutoff tool that passes into the slot cut by the preceding tool, then across the bottom of the slug when turned by lever or handwheel, and (4) a long-bar facing tool for cleaning out the bottom of the rough-machined grid basket after the slug has been removed.

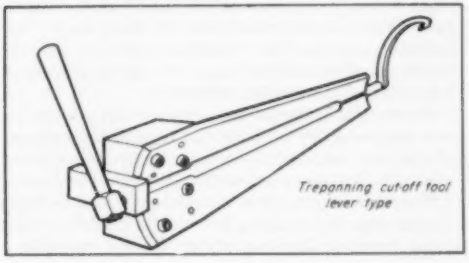
Two sets of similar tools were necessary, because of differences in size of anodes and grids for the 400-amp and the 800-amp rectifiers. However, when the first set (for the 800-amp parts) was completed and put into production, it was found that the lever-operated cutoff tool was difficult to control for as smooth a cut as was desired. As a result, when tools for the smaller 400-amp grid and anode were developed, design of the cutoff tool was modified to provide for turning it with a worm-and-worm wheel controlled with a handwheel.

Anodes and grids for the 400-amp rectifier tubes are machined from graphite cylinders approx 8¼-in. dia. For making the 800-amp parts, the graphite cylinders are nearly 13-in. dia. Savings realized from using these tools aver-average $20 per anode. Grade K8 Kennametal cemented carbide tips minimize tool wear.

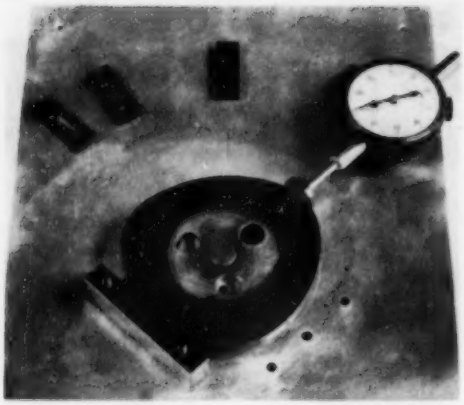
When groove has been completed with tool in foreground, lever-controlled cutoff tool is moved in to bottom of groove as shown, then swung in an arc to cut across bottom of slug to be removed for making anode

When cutoff tool has been removed, center slug is easily broken from the remaining center section with light tap of soft mallet. Later, long-bar facing tool finishes bottom of grid basket bore

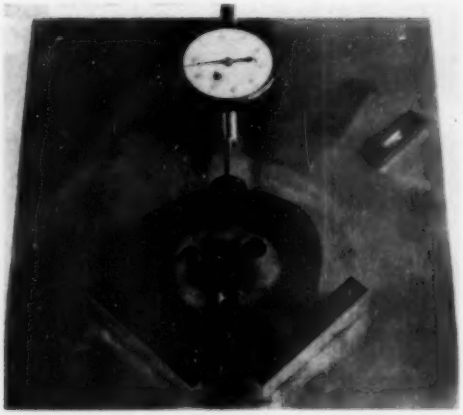




Trepanning and cutoff tools for the 400-amp grid and anode are similar to those used for the 800-amp parts, but slightly smaller. Shank of trepanning tool, and bar and support blades for the cutoff tool, are forged from high-carbon (1.00 to 1.10% C) tool steel, then annealed, hardened and drawn to 42-44 Rc. They are finished all over, without nicks, as they are highly stressed in use. Carbide tips overhang supporting steel approx ⅛ in. all around and have 6° positive rake



Fixture setup for 2-point measurement, as with a micrometer. Place the round piece between gaging points and set dial to zero. Substitute the 3-lobe workpiece and rotate under the indicator. The needle will not show any obvious out-of-round, proving 2-point measurement is valueless

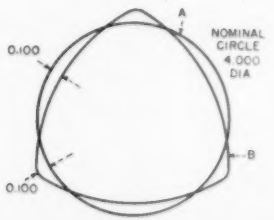


90° V-block is most common setup. Set dial to zero with the round part; then insert and rotate the cam-shaped part. Total indicator variation will be 0.200 in. either side of zero, or a total of 0.400 in., which is exactly twice the actual out-of-round of the work

HOW ROUND IS ROUND?

It isn't enough to specify how much out-of-round is permitted on a job . . . You must also specify how it is to be measured . . . Here's a simple explanation of why you can't measure it by conventional methods

By ALBERT C SANFORD
FEDERAL PRODUCTS CORP



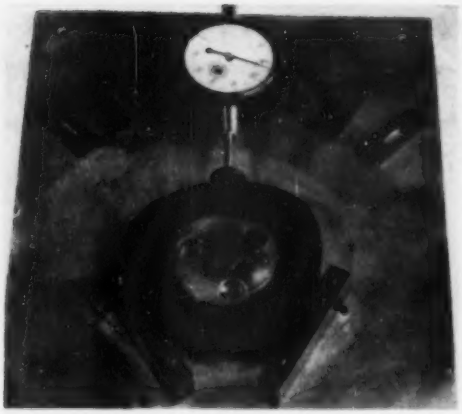
Out-of-round may be defined as the total radial variation from a true circle. Part A is a true circle, 4 in. in dia; part B is a 3-lobe piece whose total variation equals 0.200 in. Out-of-round can also be expressed as the algebraic sum of radial ± deviation from the true-circle size as obtained by 2-point measurement

Out-of-round is one of the most loosely defined characteristics for which limits are specified on blueprints. Generally, the blueprint specification is merely a simple statement. "Out-of-round shall not exceed 0.002-in. total indicator reading"—but no additional specifications are given as to exactly how this measurement should be taken. Depending on the exact method used for measuring out-of-round, this apparently definite specification can be interpreted in a number of ways, and further, depending on the method used, the results obtained on any one piece may vary widely.

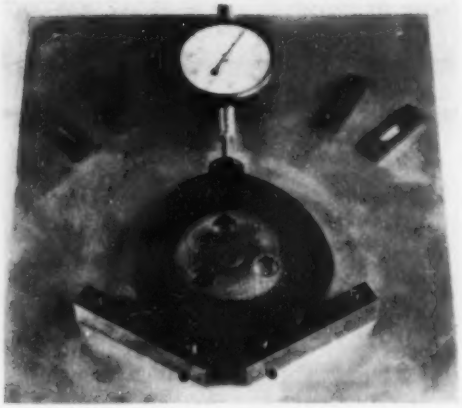
To illustrate this graphically, a special demonstration fixture was made up. This provides two reference bars which can be pivoted to form 60, 90, or 120° vees. It provides various possible mounting positions for the indicators. One of these is on a line bisecting the angle of the vees. There are additional mounting positions on either side, 30 and 45° off the bisecting line. All these are located so the indicator racks always point toward the center of the workpiece. With the various possible V-block angles and indicator positions, it is possible to provide a fairly simple visual demonstration of the effects of various out-of-round measuring methods.

Knowing that the 3-lobe piece varies ± 0.100 in., or a total of 0.200 in. from the true circle diameter of 4 in., it is possible to see what results are obtained when the fixture is set up for different conditions.

Where out-of-round is to be checked on a quality-control basis with just a few pieces out of a batch being sampled, any one of the V-block methods is



60° V-block is also commonly used for measuring. The same procedure will show a total indicator travel of 0.600 in., or three times the known out-of-round. In all cases the indicator is set exactly on the line bisecting the included angle of the V



120° V-block gives a total indicator travel of 0.200 in., or the exact, known amount of out-of-round. However, it must be realized that the V-block check indicates only the amount of out-of-round. It does not serve as a check on the required dia of the part

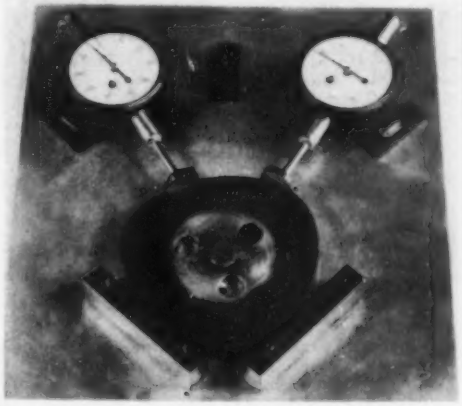
satisfactory, as long as the results are understood. In measuring out-of-round, the operator must read and remember the total sweep of the indicator hand, disregarding the actual starting and finishing points. Whether the piece be oversize or undersize, the out-of-round is being measured as a separate function, and the total sweep of the indicator hand rather than the position of the sweep determines out-of-round.

Where production is high and every piece must be checked, it is necessary to find some means of duplicating this result on an automatic basis.

Most measuring devices provide high and low limit light setup positions for size rejection. If out-of-round is expressed on the print as a characteristic, separate and distinct from size, it becomes necessary to check out-of-round as such, and disregard entirely any normal size variations. If separate checks are not made, a large piece will be rejected for a small out-of-round condition and a small piece with a large out-of-round will pass a size-measuring device.

To measure out-of-round automatically, and disregard normal size variations, a different approach is necessary. A fixture is set up similar to the double-indicator fixture shown, but the indicators are replaced with special electronic gage heads. These heads are connected through their respective amplifiers to a device known as a differential classifier. With this arrangement, the gage heads ignore normal size variations in the workpiece. Given a round workpiece, both gage head spindles will rise and fall simultaneously. When this condition exists, the classifier ignores it. As soon as one gage head spindle moves further than the other, in an amount exceeding the out-of-round tolerance, the classifier notes this difference and causes a reject signal.

There are a number of conclusions to be drawn:



Rotating the work in a double-indicator setup shows that it is impossible to read the indicators and understand what is going on. But if readings of each indicator are plotted for every 5 or 10° of rotaton, the results become more intelligible

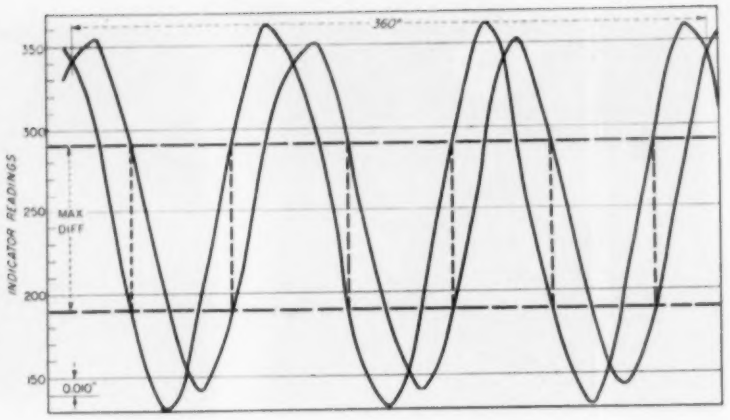
Perhaps the most obvious is that if out-of-round tolerances are to be established on a blueprint, it would seem necessary to specify the method of measurement.

If out-of-round checking is to be done on an automatic basis, something other than the simple V-block and indicator method must be used. One possible method of accomplishing this is with the double electronic gage head and differential classifier.

It is obvious that if the 3-lobe part were a plug, then the hole would have to be 4.200 in. rather than

HOW ROUND?

continued



Curves plotted for one complete revolution of the work. Maximum deviation of the sample from a true circle is seen to be 0.100 in., and this occurs six times in one revolution. Note that maximum difference does not occur at either maximum or minimum reading

4.000 in. before the plug could enter that hole. This is one of the reasons why parts which have the 3-lobe condition and pass a 2-point measurement inspection will not enter a mating part.

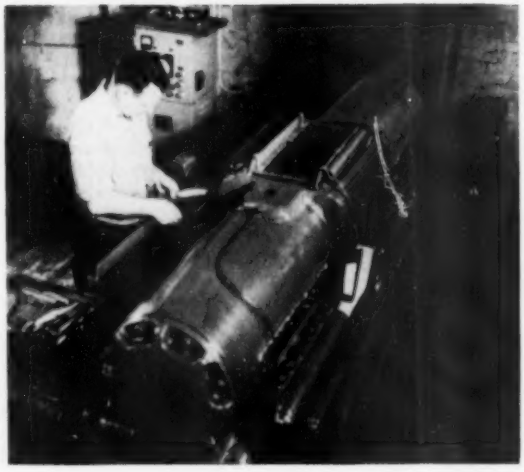
If the 3-lobe part were a hole, then the plug would have to be 3.800 in. before it could enter the hole.

Two additional conclusions are also possible. If the mating parts are a plug and hole, such as a piston pin and piston, out-of-round is important and must be controlled, primarily because it affects the fit. Out-of-round parts would also tend to wear much more quickly because they touch only on the high points.

If the parts are going to ride between two surfaces, such as rollers in a roller bearing, 3-point out-of-round will probably not make quite as much difference as it does when the parts are a plug and hole. In an application such as this, the two bearing surfaces form a contact with the roller in much the same manner as a 2-point method of measurement. In this instance, the out-of-round will have less effect on fit and probably less effect on wear.

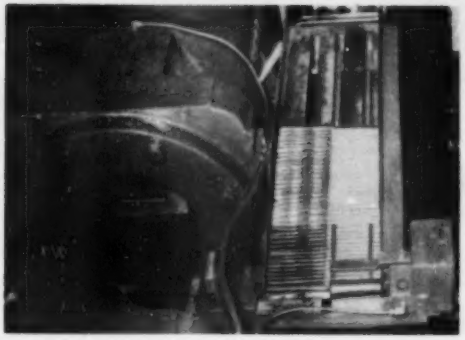
Cold-Forge Stainless Handles in Mid-Air

International Silver Company, Meriden, Conn, more than doubled its production rate on knife handles with a new mechanized process. . . . Forging is done with one blow, after automatic feed and positioning

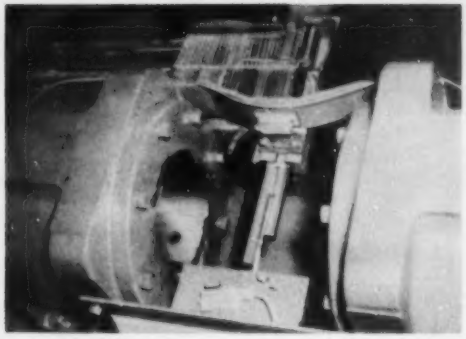


Forging is done between two opposed impellers moving horizontally, each driven by a double-acting air piston, meeting for less than 1/3000 sec. After starting the machine from the control panel in the background, the operator merely places blanks on a conveyor belt and checks finished pieces. Feed, positioning, forging, and ejection to a totebox behind the machine are all automatic at 50 strokes a minute

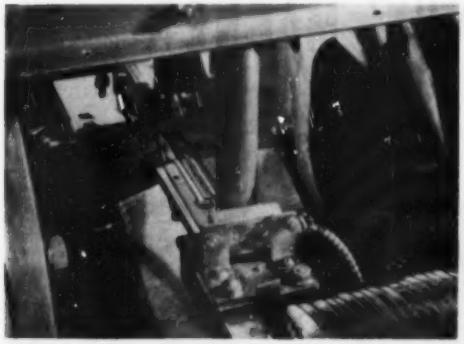
COLD-FORGE STAINLESS HANDLES IN MID-AIR



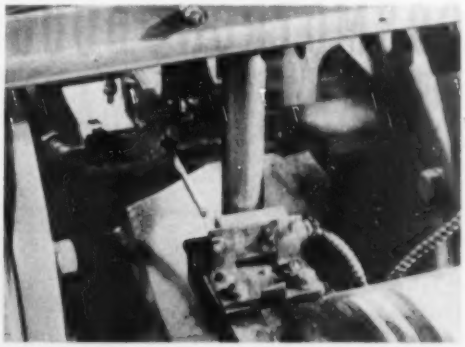
Knife blank has blade tang driven into a slot in one end of heavy-gage stainless tube. Operator places them, cutting edge up and butts all one way, on belt conveyor which carries them to twister (cylinder at lower right). This rotates to place them, one at a time, in a slot in a reciprocating feeder arm. Here also can be seen one die on the ram of the impeller piston



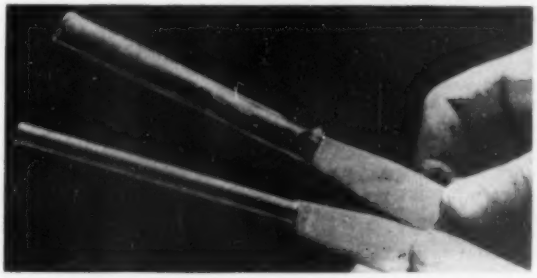
Feed slide advances to place the knife blank, blade in a vertical plane, in the impact position. Micro Switches at either side act as sensing heads to detect any eccentricity of plane of impact. They are touched by rams as they pass, to actuate an electronic compensator. Any eccentricity in the blow is automatically or manually corrected. Impellers are carefully balanced for weight and friction in cylinders to within 5 lb of force



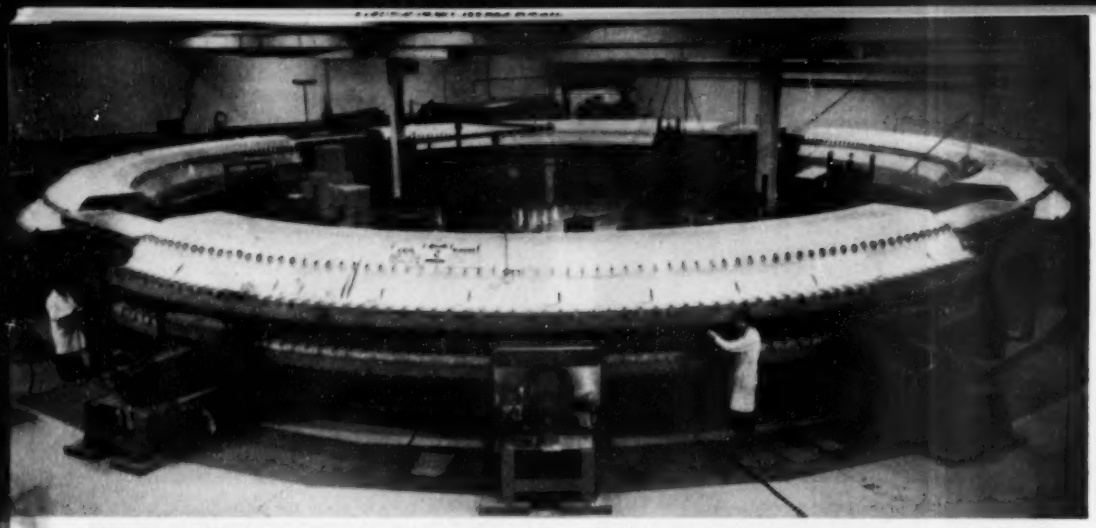
Blank is gripped by the blade in an air clamp (rear) which holds it in impact position. Then feed slide retracts. Dies will hit the blank from both sides at once, reducing energy required 23%. Blow intensity is adjusted roughly by altering striking-air pressure from receiver through a regulating valve from 60 to 100 psi, adjusted closely by electronically operated valves which meter the "slugs" of air that "shoot" the impellers as projectiles



Forged handle, after impact, is vibrating slightly here. Blurs at each side are dies being retracted by air. There is no rebound, as in conventional hammer forging, because energy of the two elastic bodies (impellers) is delivered to the inelastic body (the blank) between them until they meet, then absorbed. Because of this, there is no vibration, so machine can be set anywhere, even on a wood floor several stories up. Impellers are withdrawn by air



Completed handle (top) has ferrule where it joins the blade, is a flattened oval rounded at the far end. Slight fins at end and ferrule are buffed off. The machine, called an "Impactor," is made by Chambersburg (Penna) Engineering Company, and this is the first installation. It incorporates safety controls that prevent a blow if no stock is fed or if the stock is not properly located. Impacters can be "ganged" if work requires more than one blow



288 octagonal blocks, in four groups of 72, make up the magnet of the Brookhaven cosmotron, 75 ft in diameter. Each block is in turn made up of 12 octagonal steel plates ½ in. thick and 94 in. across. Each plate has a 9¾x43-in. slot, and slots are aligned outward to form a continuous pole gap on the periphery of the quadrants. In this gap are magnetizing coils and the circular vacuum chamber through which bombarding particles travel

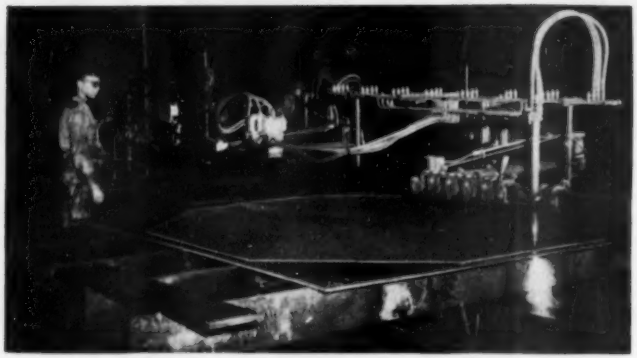
COSMOTRON 'DOUGHNUT' MAGNET IS 288 SHOP-MADE SANDWICHES

Heart of the latest and biggest "atom smasher" is close-tolerance ½-in. steel plate, fabricated and assembled by Bethlehem Steel. Here, in words, is the story of the cosmotron; and, in pictures, the story of the making of its 4-part, 3456-plate magnet

NUCLEAR PHYSICS, to most of us, is a disquieting branch of science we've recently heard too much about as the source of the atom bomb. We've heard vaguely about cosmic rays and perhaps even that such rays include particles of energies in the billion-volt range or higher, and that these particles can bombard the nucleus of an atom to break it up.

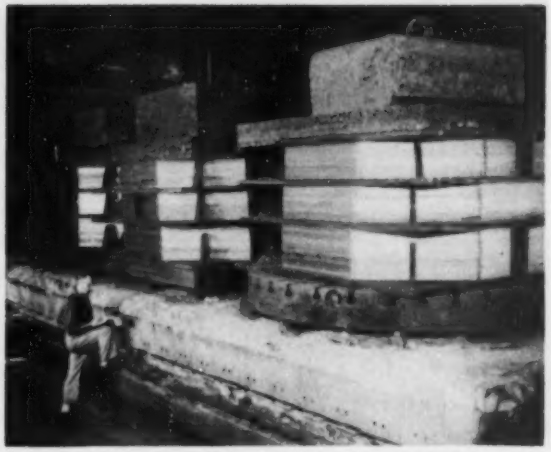
We have made cyclotrons to produce high-energy particles. They can reach energies of several hundred-million volts, and have been dubbed "atom smashers." They can bombard nuclei with protons and deuterons, and can produce mesons, the "cement" that holds the nucleus of the atom together. But they can't produce mesons fast enough for research use. There are mesons in cosmic rays, too, but only at the very low rate of a few particles per minute per square inch—too few for adequate study.

Larger cyclotrons are possible, but not practical. In the cyclotron, the bombarding particle is injected at the center of a magnet with solid pole faces. As higher and higher



1 Plates 96x193 in. were rolled and sheared at Bethlehem's Sparrows Point, Md, plant. Thickness had to be held to tolerances of ½ in., +0.01–0.02, with preference on the minus side. Octagonal members were flame-cut at Bethlehem, Penna. where assembly and finishing were done

2 Burrs from flame cutting were removed by grinding each plate along all edges with an air grinder. Throughout this and succeeding operations, great care was required to maintain dimensions to insure a constant circular path for the cosmic rays traveling at high speed



3 Stacked in groups of 24, plates were sandwiched between flat surfaces, weighted, and stress-relieved in a car-bottom furnace. Weights maintain flatness during stress-relieving, done to insure dimensional stability. Scale was later removed by disk-grinding all surfaces

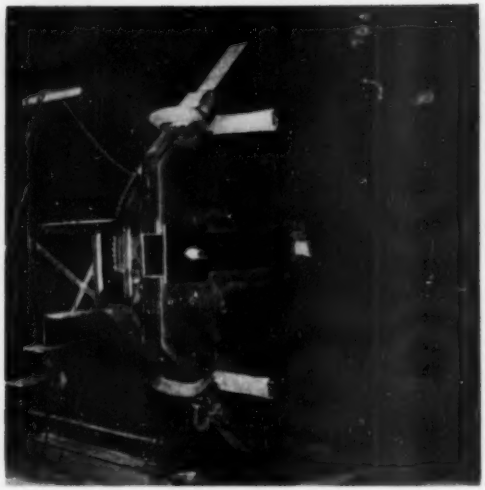
4 Blocks were assembled on a weld positioner. Each is really a transformer, so insulation is placed between plates to mimimize eddy-current losses. Each face is cleaned with an organic solvent, checked for burrs, then sprayed with resinous coating to hold insulation in place until the next plate has been added to the assembly.

5 Insulation consists of two sheets of insulating fiber, each 0.006 in. thick, with a sheet of aluminum foil, 0.0005 in. thick, sandwiched between. The foil has tabs extending beyond the plate edges at two points (one is at top right) to permit later checking for shorts with an ohmmeter

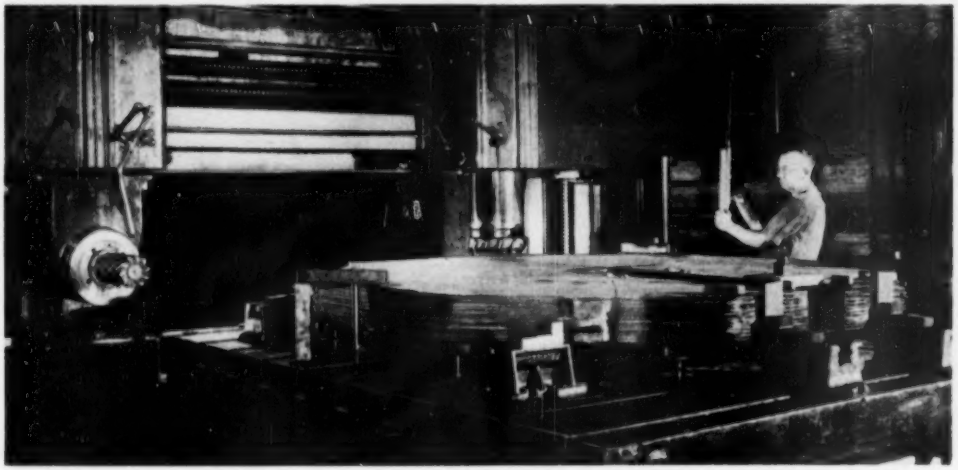
energies are applied, the particle accelerates and moves to the periphery of the pole faces in a spiral path. To apply energies of a billion volts or more, the solid magnet becomes so large its cost is prohibitive.

To avoid this difficulty, scientists and engineers at Brookhaven National Laboratory, Upton, L I, N Y, teamed up to design a magnet built as an annular ring, in which the bombarding particles move in a circular path at constant radius, the magnetic field being increased as the particle gains speed. The doughnut design saves much metal and cost, and permits bombarding particles of hydrogen nuclei with an energy of two to three billion electron volts. To simplify electri-

6 **Tabs on the aluminm foil** make it possible to check welded blocks for shorts. An ohmmeter is connected between foil and adjacent plates in turn. The foil is not usual in such equipment, was inserted in this case to permit electrical checking of assemblies



7 **Completed assemblies** are tested thoroughly, then permanently welded by five tie bars across edges. Two tie bars have lifting hooks (one at lower left, other at lower right) so the completed block can be handled. Eight stainless-steel attachments are welded to one end plate for bases for coil supports

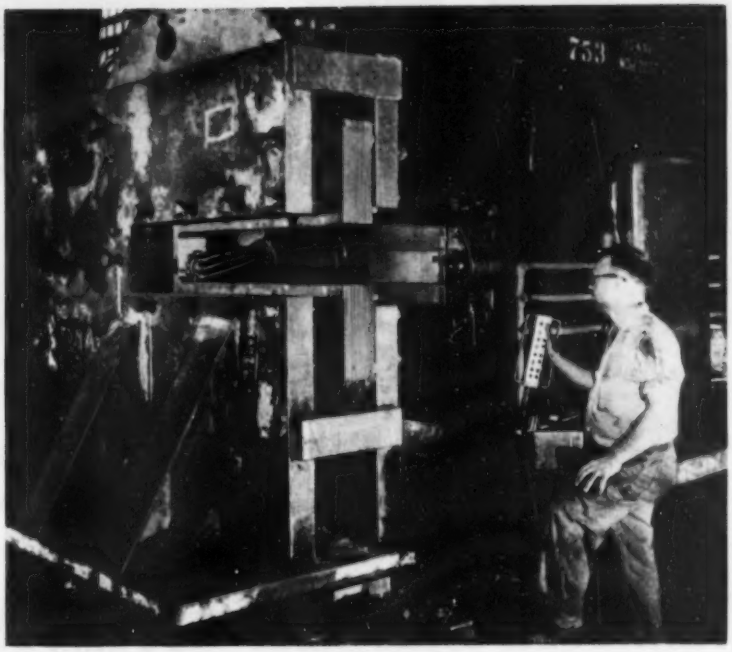


8 **Rear edges of blocks** (opposite the gap) were beveled to allow them to nest to required radius of the quadrants. The face which became the base (next to operator here) was finished on the same planer-type miller. Tolerances are close, for accurate positioning of the magnetic field

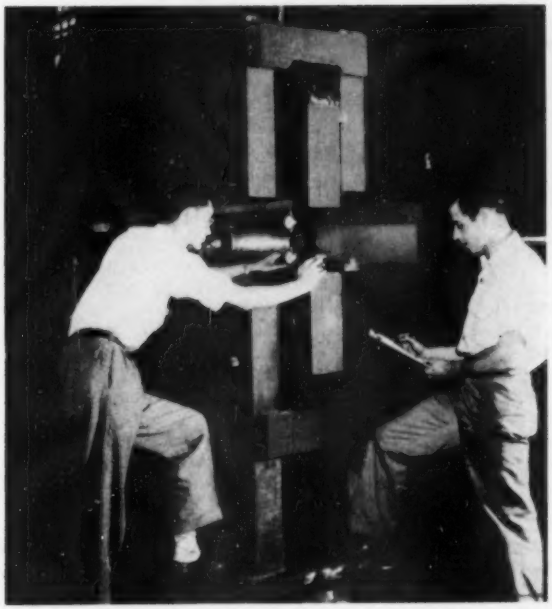
cal engineering of the unit, particles are pre-accelerated in an electrostatic generator to an energy of 3½ million volts, about a tenth of their final energy, before introduction into the "cosmotron," as the new smasher is called.

The magnet of the cosmotron, about 75 ft in diameter, was fabricated and erected by Bethlehem Steel Company at its Sparrows Point, Md, and Bethlehem, Penna, plants. The largest element of the machine, it holds atomic particles in a constant orbit while they are accelerated by a radio-frequency system around its periphery at about 3 million times a second, ultimately attaining a speed closely approaching that of light (about 186,000 miles per second).

COSMOTRON 'DOUGHNUT' MAGNET... continued

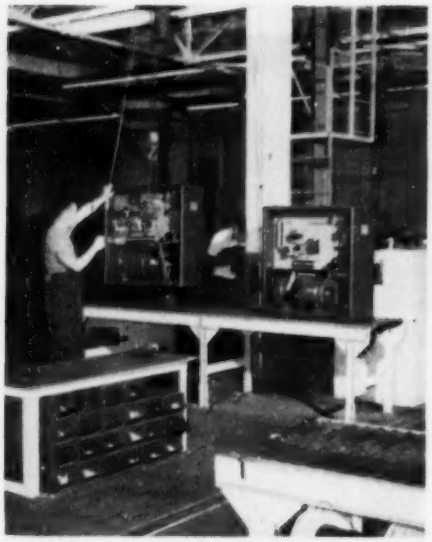


Most critical job was contouring the gap to a tolerance of 0.0005 in., with taper not exceeding 0.002 in. per in. over the entire length. This was done in a heavy fixture on a horizontal miller, and the nose of the block (nearest face in the photo) finished simultaneously with the same cutter



10 **Gap dimensions** were checked with twin dial indicators in a special mount running along a straightedge, plus other more usual equipment, first before removal from the machining fixture, and again after removal to a rack, thus free of clamp pressure

11 **Block faces** were painted with regular metal primer, machined faces and the slot with a rustproofing compound. The rest of the surface was covered with waterproof sealer. Blocks were wrapped in waterproof paper and placed on wooden pallets for shipment to Brookhaven



CABINET, control panel and drive unit are bolted together on table, then hoisted to conveyor

WIRING OPERATOR uses transfer car to take mechanical assembly to conveyor-section wiring bench

TRANSFER CARS KEEP ASSEMBLY MOVING

Roller conveyors establish a definite flow of production, and transfer cars link them. Handling time is reduced between stations, and damage to work in process is reduced

BY E. L. BRAINARD, Asst. Plant Engineer, EUCLID PLANT, RELIANCE ELECTRIC & ENGINEERING COMPANY

With a system of transfer cars and roller conveyors, we are able to assemble, test, paint and crate V*S variable-speed drives without chance that units will become "lost" at repair or other stations. Furthermore, our system enables operators to work in comfort and without being compelled to lift heavy weights.

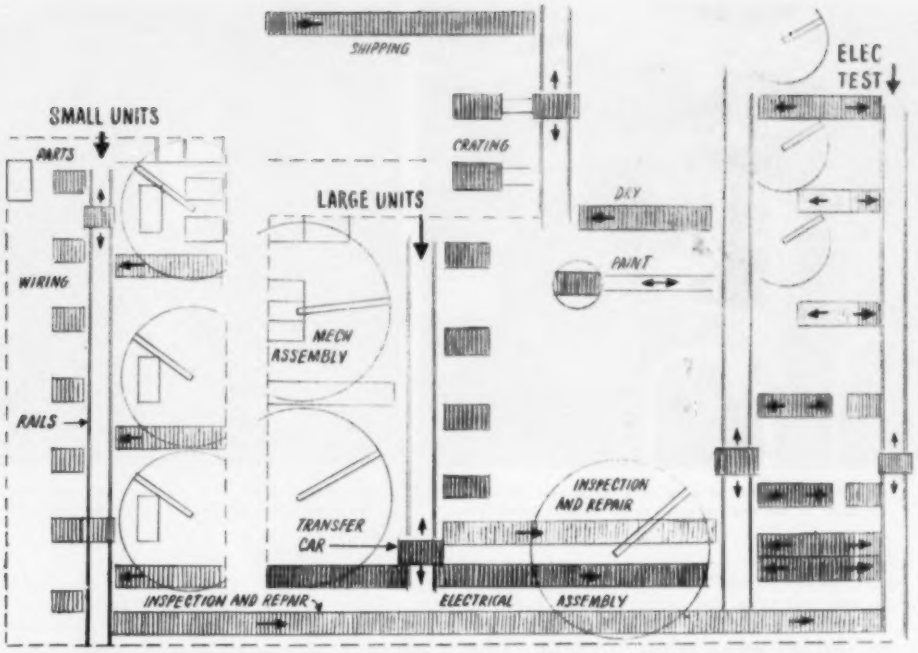
Although we have four sizes of cabinets, the assembly effort splits naturally into three general sizes of work (two illustrated in diagram). So operators can concentrate their efforts in a working area from 32 to 40 in. above the floor, large and small units move on transfer cars and roller sections placed 14½ and 30 in. from the floor, respectively.

Assembly starts with sub-assemblies brought from the stockroom — the control panel, power unit, and cabinet. In the case of the small units (3-15 V*S), a male operator puts the cabinet on a table with a jib crane, then installs the power unit and control panel. He has bins of fastening devices, etc, arranged for his convenience.

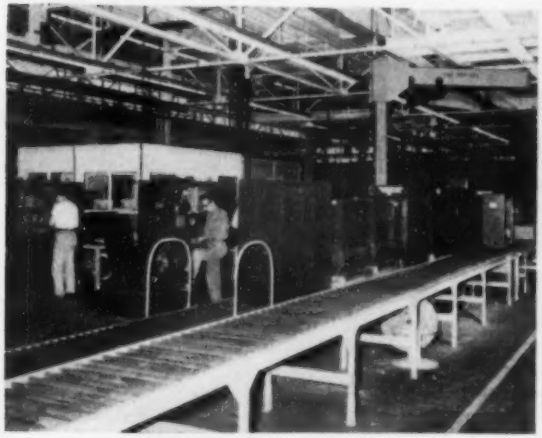
When the chief components are fastened together, the operator uses the jib crane to transfer the assembly to a roller section. This conveyor feeds toward a transfer car that runs on rails. A safety stop restrains the work until a girl wiring operator needs work and uses the transfer car to take the assembly to her station. Here the "bench" is a section of roller conveyor. When wiring is finished, the transfer car is again used to transfer the wired drive unit to a long inspection and repair conveyor that is likewise 30 in. high.

Large cabinets (20-30 V*S) are assembled in an adjacent area. In this case, the cabinets are laid on their sides and the control panel and drive unit are lowered into them by jib crane and fastened. Wiring is done on roller sections 14½ in. above floor, to bring the working area 32 to 40 in. above floor. Operators can stand or sit at their tasks.

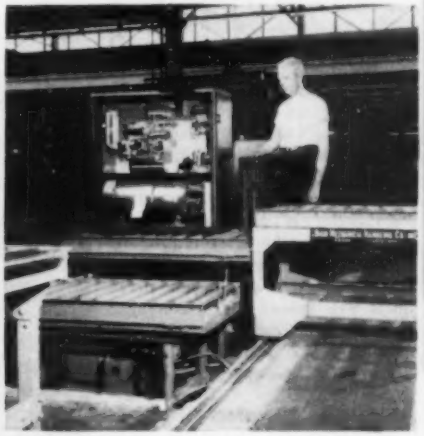
Inspection and mechanical testing of the two sizes of unit are carried out on parallel conveyors, 30 and 14½ in. high, respectively. In ordinary circumstances, 75% of defective work can be corrected on these two conveyors, and flow of material is not disturbed. However, if more than normal time is required for repair, the defective unit is swung by jib crane to a third, parallel, roller conveyor. Defective units thus are concentrated in one visible location and the chance of lost or misplaced units is practically zero.



BY USING CONVEYOR SECTIONS and transfer cars, work flow follows an established pattern, workers are assigned to specific areas, there is no waiting for trucks, and there is no chance for material to be lost



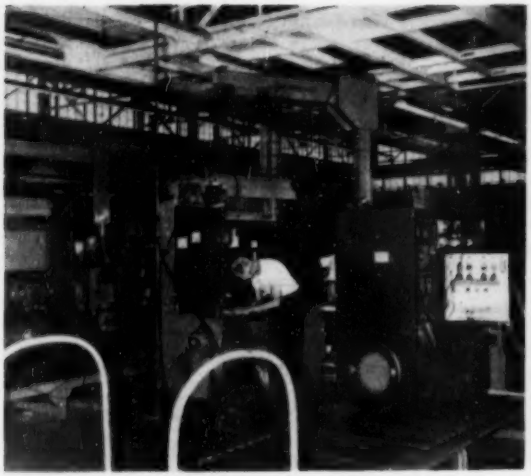
MECHANICAL INSPECTION and repair of small and large units are handled on two parallel conveyors of different heights



TRANSFER OF SMALL units from the 30-in.-high conveyor to low conveyor is done by elevator

Inspected units are transferred to electronics and electrical test stands. These are again conveyor benches, to permit ease in spotting the drive units at the exact point required. Note from the diagram that the electrical-test area is served by transfer cars running on rails along each side. One car has a 30-in. height for direct transfer of small units onto the test stands. When these units have passed the electrical and dynamometer tests, they are brought back by transfer car to electric elevators, which drop them down to the 14½-in. level used for the large drive units. Now they can be picked up by low transfer car and taken to the paint-spray booth. Thus, the low-level transfer car serves two purposes: (1) to handle large units to the electrical test area and thence to paint, and (2) to take tested small units to paint.

One paint-spray booth handles



ELECTRICAL TESTING of drive units (large ones shown) is done on conveyor sections, which minimize handling

SPRAY PAINTING on a turntable, with unit left on transfer car, allows painting at controlled rate

all drive units. It has its own transfer car that takes the tested unit from the transfer car serving the electrical-testing department. In the booth there is a turntable onto which the car is run. Painting on a turntable avoids much handling, and allows the operator to spray paint at a controlled rate.

Painted units are transferred to a roller section for air drying. This conveyor is also serviced by a transfer car that takes units to "inspection for appearance" and first stages of crating. Final-crating transfer cars can be pulled back into an area where the crater has adequate room for the assembly of crate sides. After crating, the drive units are moved to a conveyor section that weighs and stores finished work until it is trucked to the shipping department.

Advantages of System

There are several advantages to the conveyor system:

1. Greater safety to work and operators is obtained because less handling of units is required.

2. A definite flow of production is secured, and units cannot be sidetracked and lost.

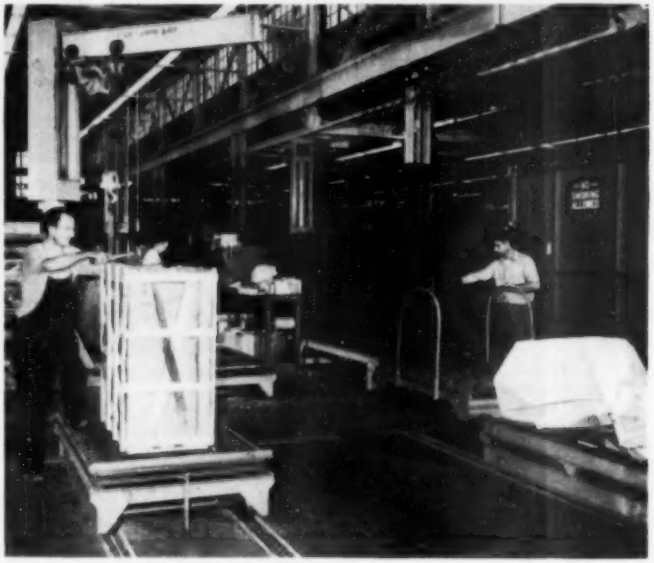
3. Handling time is reduced, because a truck and operator are not required to move units from one work station to another.

4. Repair costs are reduced, because there is less chance of damaging the cabinets. Transfer cars have stops to prevent work from rolling off; likewise the conveyor "benches" where work is performed.

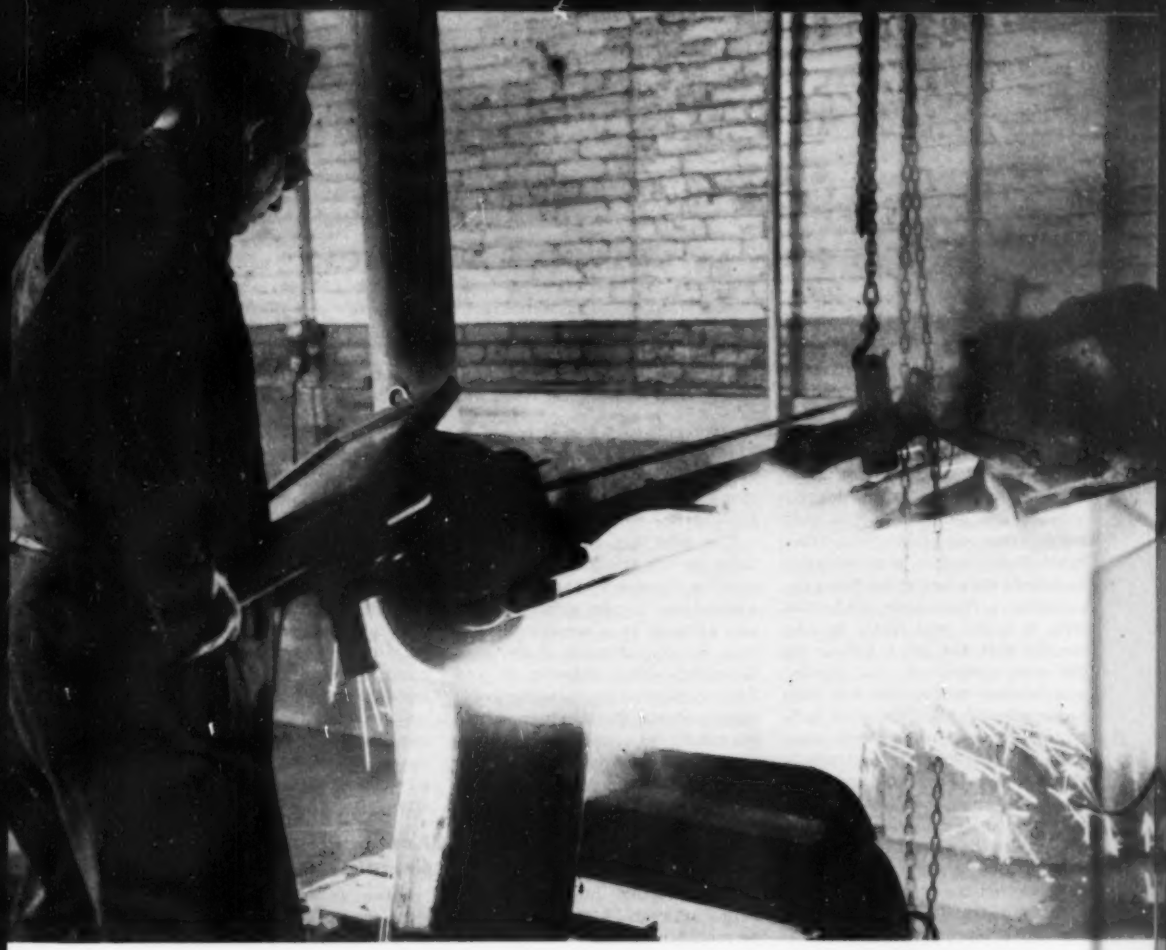
5. Conveyor sections and conveyor work stations act to assign definite working areas.

6. Conveyors provide in-process storage without loss or diversion of units.

7. Parts bins, test equipment, etc, can be placed conveniently for the operators.



CRATE ELEMENTS are made up in the department and applied to finished unit, while it is on a transfer car convenient to crater



HOW TO GRIND TITANIUM

BY DR LEO P TARASOV
Research and Development Department,
NORTON COMPANY,
WORCESTER, MASS

Grinding has been one of the greatest problems in the machining of titanium. First results were discouraging because the wheel wore faster than the work was removed. By last year it had been found that lower wheel speeds would make possible the removal of better than 2 cubic inches of titanium per cubic inch of grinding wheel—a great improvement but discouraging compared with the grinding of any other structural metal. Tests at the Norton Co during the past year have revealed, at least in a preliminary way, how each variable affects the grinding ratio. Under the best conditions, it is now possible to remove 15 or 16 cubic inches of titanium for each cubic inch of wheel wear. Here are the most comprehensive data yet available on grinding titanium with procedures that make it a little easier than grinding high-speed steel.

American Machinist SPECIAL REPORT No. 322 TO THE METALWORKING INDUSTRIES

Copyright 1952 by McGraw-Hill Publishing Co, 330 W. 42nd St, N Y 36, N Y.

FACTORS IN GRINDING TITANIUM

When titanium first became commercially available, it was considered to be an extraordinarily difficult metal to grind, largely because any wheel that was used wore extremely fast. This often made it impossible to grind parts to desired accuracy at anything resembling a reasonable production rate. A wheel was likely to lose contact with the work before the cut was completed, but harder wheels were not the answer, both because they burned the work badly and because the wheel wear remained just as high, contrary to all normal experience. Loading of the wheel and poor finish were also frequently encountered.

This situation persisted until the summer of 1951, when it was discovered that the secret of grinding titanium successfully was to reduce the wheel speed far below conventional practice. In this manner, the *grinding ratio* (defined as cubic inches of material removed per cubic inch of wheel wear) rose from 0.7 or thereabouts for the best conventional surface grinding practice, with the wheel running at 6000 sfpm, to 2.3 when the wheel speed was dropped to 2200 sfpm. These results were obtained with commercial high-strength alloys like Ti-150A and RC-130-B.

table I . . . GRINDING RATIOS FOR HARDENED TOOL STEELS

High-vanadium high-speed steels	0.4 to 1.0
High-chromium, high-carbon steels	3 to 4
Most commonly used high-speed steels M-2 (6-5-4-2), T-1 (18-4-1)	4 to 12
Plain-carbon and low-alloy tool steels	40 to 80

The next big step forward in these surface grinding experiments was the discovery that in the low wheel-speed range, grinding ratio was affected to a remarkable degree by the grinding fluid used. Grinding ratios between 6 and 7 were obtained by changing to the most suitable fluids, other grinding conditions remaining the same. Finally, a large additional improvment resulted from finding the best combinations of wheel specifications and wheel speed to use with the highest-ranking fluids. Under the best combination of conditions found thus far, grinding ratios between 15 and 16 can now be readily obtained.

Comparison with Tool Steels

The practical significance of the grinding ratios that have been cited can best be illustrated by reference to hardened steels, whose grinding characteristics are well known. The dimensional tolerance that can be maintained in grinding titanium will be equal to that for a steel having the same grinding ratio, assuming that the wheel size and the area of the ground surface are the same for both metals. A knowledge of the grinding ratio permits the calculation of wheel wear for any wheel size and volume of stock to be removed. For a normal surface grinding operation with the wheel periphery, the grinding ratios listed in Table I can be considered as typical.

Thus instead of being in a class with the high-vanadium high-speed steels, which are recognized as the most difficult of all tool steels to grind, titanium can now be thought of as being somewhat easier to grind than ordinary high-speed steels, provided it is feasible to use very low wheel speeds. However, even under the best possible conditions known at present, titanium is still not nearly as easy to grind, from the standpoint of wheel wear, as carbon tool steel or carburized steels. Only further experimentation will tell whether additional substantial increases in the grinding ratio for titanium can be attained.

Explanation of Grinding Behavior

Since excessively high wheel wear was originally the principal stumbling block to successful precision grinding of titanium, most of the effort was devoted to investigating methods of reducing wheel wear (or increasing the grinding ratio), without going so far, of course, as to spoil the test bars. It turned out that when grinding conditions were changed to reduce wheel wear, it also became easier, in general to get a smooth, unsmeared finish and to eliminate burn. In order to understand the reason for this, consider the methods by which a wheel can wear.

One kind of wear involves a rubbing away of the sharp edges of an abrasive grain. This wear by attrition, when it has proceeded long enough, results in a glazed appearance of the wheel face. As the flat area on a grain gradually becomes enlarged by repeated contact with the work, the frictional

force acting on the grain may become sufficient to cause it to fracture, forming new cutting edges, or even to break the bond posts, throwing the grain out of the wheel. If the grain is not sufficiently friable or the bonding is too strong, the outer grains stay dull and the wheel requires dressing to restore sharpness.

Attritious wear normally proceeds slowly when steels and other common materials are ground, and it is for these that conventional grinding practices have been developed. However, under the same grinding conditions, the attritious wear occurring in titanium grinding is extraordinarily high, so high that fracture wear is negligible by comparison. The result is that the total wheel wear is not affected by changing the grade of the wheel.

When the wheel speed is lowered appreciably, the temperature at the point of contact between abrasive and titanium is also lowered, decreasing the surface reaction between the two and reducing attritious wear. If the wheel contains enough bond for the fracture wear to remain negligible at a lower wheel speed, then the decrease in wheel wear will be essentially equal to the decrease in attritious wear.

With further decreases in wheel speed, fracture wear becomes more and more pronounced while attritious wear is becoming smaller. At some speed, the total wear passes through a minimum and then rises at even lower speeds where fracture wear is predominant. Correspondingly, the grinding ratio first increases as the wheel speed is reduced, passes through a maximum, and then decreases.

Certain grinding fluids intensify this effect of wheel speed to a marked degree by comparison with the small effect observed when grinding dry or with plain water. The fluids that have the most beneficial effect are chemically active in the grinding process. Their function is to contaminate the freshly formed titanium surface in contact with the wheel in such a way as to decrease markedly the surface-chemical reaction between the metal and the abrasive. At conventional wheel speeds, they do not have sufficient opportunity to perform their contaminating function and are little, if any, better than the majority of grinding fluids, which are of relatively little help in raising the grinding ratio when the wheel speed is reduced.

The nature of the chemical activity necessary for a marked beneficial effect is obscure at present because a number of grinding fluids that might logically be considered in the chemically active group do not raise the grinding ratio nearly as much as do the most suitable fluids in the same category. These and other observations, all indicate that chemical factors are considerably more important than mechanical factors in the successful grinding of titanium.

Other Grinding Operations

The work that has been done thus far has been limited to surface grinding with vitrified bond wheels. It is reasonable to expect that similar benefits will accrue from the use of low wheel speeds and suitable grinding fluids in other types of precision grinding operations with vitrified wheels. At one large jet-engine plant, preliminary results indicate that low wheel speed will be helpful for cylindrical and internal grinding operations.

Some preliminary studies with organic-bond wheels failed to show any benefit from low-speed operation, but this lack of success may have resulted from unsuitable wheel specifications, just as softer grades of vitrified wheels wear more rapidly at low speeds than at conventional speed. As for constant pressure operations, like snagging, it is not yet known whether low wheel speeds will be the answer, but work is now under way to see what can be done.

GRINDING FLUIDS

As a result of preliminary studies, the grinding conditions listed in Table II were used in evaluating a wide variety of grinding fluids. The grinding ratio was calculated from the change in thickness of the test piece and the change in diameter of the wheel, both being measured to 0.0001 in. with micrometers. Repeated check runs with plain water and occasional check runs with a few other fluids showed that grinding ratios could generally be reproduced within a few percent.

A total of 69 commercial brands supplied by 16 manufacturers, as well as 22 experimental fluids, were tested. A number of typical water-miscible compounds (soluble oils, so-called synthetic or non-petroleum compounds, and rust inhibitors) were used at various nominal concentrations, as low as ½% by volume and as high as 100%. The straight grinding oils were tested as received. Water, air (dry grinding), and carbon dioxide were also included in the study.

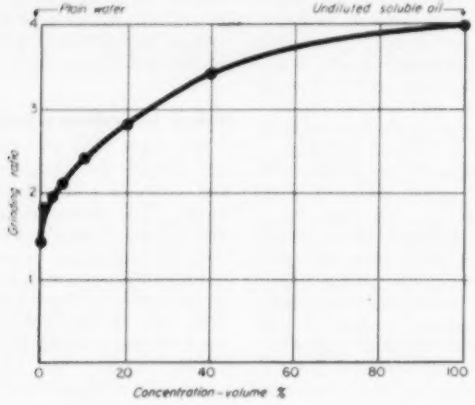
The grinding fluid (except carbon dioxide) was supplied through an ordinary nozzle in sufficient volume to flood the work surface.

Carbon dioxide was applied through a special 0.016-in. dia nozzle connected to a tank of liquid carbon dioxide.

Effect of Concentration

When representative water-base compounds were studied at a variety of concentrations, it was found that the grinding ratio increased continuously with concentration, as illustrated in Fig. 1 for a typical general-purpose soluble oil. At low concentrations, there was relatively little difference between the

FIG. 1—EFFECT OF SOLUBLE OIL CONCENTRATION ON GRINDING RATIO



various products tested but the differences became increasingly pronounced as the concentration increased. A 10% concentration was selected as standard for evaluating the fluids — high enough to establish their relative effectiveness. Higher concentrations were considered inadvisable because emulsions might be unstable under continued use and because chemical solutions like the rust inhibitors might be too strong to be handled safely.

Results of Preliminary Study

Under these conditions, and at wheel speed of 2500 sfpm (mentioned here because much better results were later obtained with some fluids at even lower speeds), the grinding ratios for the three most suitable rust inhibitors out of the five tried were between 5.0 and 5.6, the other two being 3.8 and 4.1. The grinding ratios for other water-miscible products (soluble oils, synthetic compounds, and mixtures of these) were definitely lower. The values for the six best brands were between 3.2 and 4.0 while for 33 others they were between 1.7 and 2.9. The grinding ratios for the four most suitable straight grinding oils were between 6.3 and 6.9, while for 24 others they were between 1.8 and 5.4.

The lowest grinding ratio of all, 1.4, was obtained with plain tap water. Dry grinding, for which the figure was 2.0, proved to be a little better, on a par with the lowest ranking straight oils and water-base compounds.

The results obtained with carbon dioxide were wholly unsatisfactory —the grinding ratio was no greater than for dry grinding and the wheel became badly loaded. With a single high velocity jet applied through a 0.016-in. dia nozzle, the grinding ratio was 1.9, practically the same as for dry grinding, but more effective coverage of the titanium surface with two opposed jets lowered the grinding ratio by about 40%.

table II . . . STANDARD SURFACE GRINDING CONDITIONS

For Evaluation Of Grinding Fluids

Material - Ti-150A (Rockwell C38)
Machine - Norton 6 x 18" surface grinder
Grinding wheel - 32A60-K8VBE, 8 x ½ x 1¼ in.
Wheel speed - 2500 sfpm
Table speed - 450 ipm
Unit crossfeed - 0.050 in.
Unit downfeed - 0.001 in.
Total downfeed - 0.020 in. (following a preliminary grinding operation consisting of 4 downfeeds of 0.001 in. each to break in the wheel after diamond dressing)
Area of ground surface - about 7 sq in.

Most Suitable Brands

On the basis of the results obtained with the wheel running at 2500 sfpm, the brands listed in Table III are believed to be the most suitable in their respective groups for low speed grinding of titanium. In each group, they are listed in alphabetical order by company.

Factors Influencing the Grinding Ratio

Because of the understandable lack of detailed information concerning the make-up of commercial grinding fluids, it is not possible to say just why certain brands of fluids were so much more effective for grinding titanium than were others of the same general type. However, a few broad conclusions can be made on the basis of available information.

The four highest-ranking straight grinding oils all contained sulfurized fatty materials together with chlorine or possibly other extreme-pressure additives. In one case, sulfur was also present in the oil itself, as distinguished from the sulfur in the fat. Chlorine or other additives were present either in the oil or the fat, depending upon the brand. However, there were other brands that contained the same kinds of ingredients, yet they ranked much lower. The two lowest-ranking oils were both mineral oils, one plain, the other containing only a wetting agent. Thus all that can be said is that oils suitable for titanium grinding should contain either sulfurized fats or other additives or both, but even these ingredients may not be sufficient to make an oil suitable.

Although oils in a wide range of viscosity were tested, it was not possible to determine the effect of this variable. In a group of chemically identical oils varying only in viscosity supplied by one manu-

table III . . . MOST SUITABLE FLUIDS FOR TITANIUM

STRAIGHT GRINDING OILS

Cutmax 206 (E. F. Houghton & Co)
Excelene S-320 (D. A. Stuart Oil Co, Ltd)
Vantrol No. 5363-A (Van Straaten Chemical Co)
Economy Cutting Oil No. 2148 (White & Bagley Co)

RUST INHIBITORS

International Compound No. 47-LS (International Chemical Co)
Economy Liquid No. 1500 (White & Bagley Co)

SOLUBLE OILS AND SYNTHETIC COMPOUNDS

Hocut (E. F. Houghton & Co)
International Compound No. 152R together with No. 58 (International Chemical Co)
Rust-Lick "L-B-25" (Production Specialties, Inc)
PD 940B (Socony-Vacuum Oil Co, Inc)
Sunoco Emulsifying Grinding Oil "B" (Sun Oil Co)
Vantrol No. 630 (Van Straaten Chemical Co)

facturer, grinding ratio decreased as viscosity increased, but in a similar group from another source, grinding ratio was essentially independent of viscosity. Low-viscosity oils are given preference because they are likely to be superior in chip settling and because there was no evidence that they were inferior to higher-viscosity oils in grinding ratio. The viscosity of the four highest-ranking oils was between 50 and 150 sec Saybolt Universal at 100 F.

All the rust inhibitors tested were of the nitrite-amine type. Their effectiveness in raising the grinding ratio appears to be due to the nitrite component since similar results were obtained with a water solution of sodium nitrite of comparable strength, while the grinding ratio for water was not affected by the addition to it of a soluble amine compound. However, the presence of a suitable amine in a grinding fluid is desirable for other reasons, such as buffering the solution to keep its alkalinity constant. It is not known whether the differences in grinding ratios obtained with various brands were caused by differences in concentrations of the highly concentrated solutions furnished by the suppliers or to other causes.

So little is known about the constitution of most of the other water-base compounds (soluble oils, synthetic compounds and mixtures of these) that nothing at all can be said as to what made a certain few brands superior to most of the others in the same category. Probably, just as with the top-ranking grinding oils and with the rust inhibitors, the most suitable soluble oils and synthetic compounds are in some way chemically active with titanium so as to contaminate the freshly formed surface and thus reduce its undesirable reaction with the abrasive.

Possible Shortcomings of Suitable Fluids

Thus far the suitability of the grinding fluids has been considered from the standpoint of the grinding ratio obtained in laboratory tests but it is also necessary to consider their possible shortcomings under production conditions.

Although straight oils may present a serious fire hazard with a wheel running at conventional speeds, which result in a voluminous, extremely hot spark stream, this hazard is reduced to negligible proportions when the wheel speed is dropped to 2500 sfpm or lower, because practically no sparks are visible at these low speeds. The few sparks that do arise are no brighter (or hotter) than those given off much more profusely when steels are ground at conventional wheel speeds with the aid of grinding oils. An added safeguard is that at low wheel speeds there is very little, if any, of the oil mist that is generally present at conventional speeds, and it is in the form of a fine mist that an oil is most likely to ignite.

It is worth noting that not a single fire occurred in the laboratory tests in which oils were used, even when an oil of low viscosity (and presumably low flash point) was tested at conventional wheel speeds. However, an oil-soaked cleaning rag impregnated with titanium grinding chips caught fire soon after it was exposed to the intense white sparks generated by grinding titanium dry at 6000 sfpm. This indicates that oily titanium swarf should not be permitted to accumulate in or around the grinding machine or the exhaust system since it may be at some later time ignited by a hot spark, either from titanium or from steel. If this precaution is taken (and it is one that probably applies just as well when steels are ground), then the fire hazard from the use of oil is no greater for titanium ground at low speeds than for steels ground at conventional speeds.

Water Solutions Used at 10% Concentration

Water-base grinding fluids do not present any fire hazard but certain other problems may arise from the fact that they should preferably be used at about 10% concentration — much higher than normally recommended for most of these grinding fluids. The rust inhibitors of the nitrite-amine type are commonly used in a concentration of ½ to 1%, which is harmless to the machine operator, according to considerable experience. Much higher concentrations should be equally harmless except for the increased tendency to dry out the skin. One of the rust inhibitors has been used in laboratory tests for several months in a 10% concentration, and another brand has been similarly used in a large plant that is learning how to grind titanium parts on production basis. In neither case has there been any sign of skin trouble. The only difficulty that arose with one of the fluids was that it stained the skin yellow because of the dye it contained, but this problem was taken care of by not using any dye in subsequent shipments of the rust inhibitor. Thus, the rust inhibitors appear to be harmless to the skin even when used in a 10% con-

centration. Higher concentrations are not recommended because they may affect the skin and also because they will leave too much residue on the machine and on the work when the water evaporates.

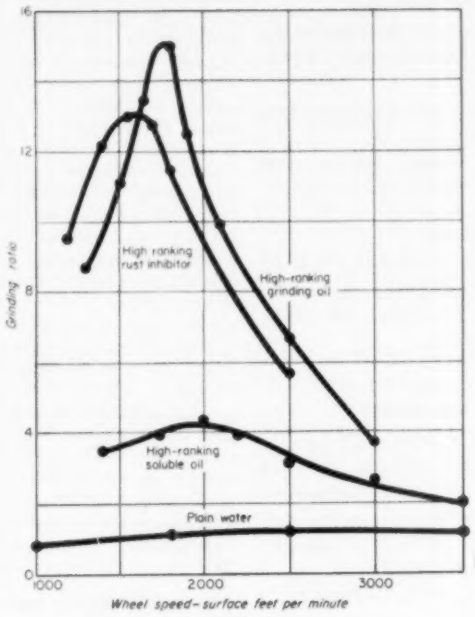
There is no reason to expect skin troubles from other water-base fluids at high concentrations, aside from those that might be encountered at lower concentrations, and the upper limit for the concentration is determined by emulsion stability. Above a 10% concentration, emulsions of soluble oils in water are likely to become unstable after a time, inverting from the desired oil-in-water type to the useless water-in-oil type. Thus, a concentration of 10% will in general result in the highest grinding ratio for the soluble oils consistent with emulsion stability, although there may be individual products that could be used at even higher concentrations.

Effect of Wheel Speed

The results discussed thus far were all obtained at a wheel speed of 2500 sfpm, which had originally been selected because it gave the highest grinding ratio when the fluid was a general-purpose soluble oil. Because this particular fluid turned out to be a low ranking one, several representative fluids were retested over a wide range of speeds. For each fluid, it was found that the curve of grinding ratio vs wheel speed passed through a maximum as the speed was reduced and then dropped off, with further reduction in speed, at about the same rate as it had been rising. Typical curves are shown in Fig 2, where the soluble oil and the rust inhibitor were tested in a 10% concentration. In general, the higher the intrinsic quality of a fluid, as determined from the grinding ratio at 2500 sfpm, the higher and narrower was the peak and the lower was the wheel speed at which the highest grinding ratio was attained.

Although only a few of the many grinding fluids that were tested at 2500 sfpm were retested at other speeds, it is very likely from the nature of the data available that the relative ranking of the fluids at 2500 sfpm will not change significantly when wheel speeds are reduced further so as to produce the highest grinding ratio for each fluid. However, the better that a fluid showed up at 2500 sfpm, the greater will be the improvement in the grinding ratio as a result of changing to the most suitable wheel speed for the fluid.

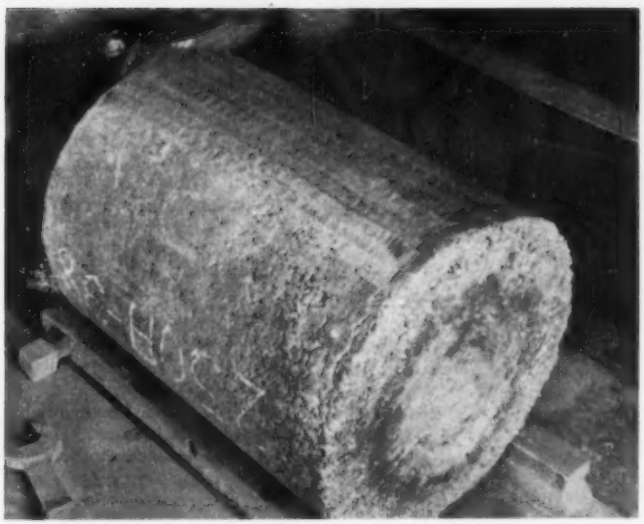
FIG. 2—EFFECT OF WHEEL SPEED ON GRINDING RATIO FOR VARIOUS FLUIDS



WHEEL SPECIFICATIONS

Abrasive

The relative value of silicon carbide and aluminum oxide abrasives for use in grinding titanium was investigated for several representative fluids and over a wide range of wheel speeds. A Crystolon wheel (37C60-K5V) was tested against a 32 Alundum wheel (32-A60-K8VBE), such as was used in the previously described experiments. The highest attainable grinding ratio with any of the fluids tested was always higher for the 32



CAST TITANIUM INGOT shows characteristic porous surface, similar to concrete, although some has been removed by swing-frame grinder

Alundum wheel than for the Crystolon one, with each wheel running at its own most suitable speed. For the Crystolon wheel, this speed was in the conventional grinding range, 5000 or 6000 sfpm, but with one tantalizing exception, the grinding ratios were much too low to be useful.

The exception was furnished by a straight grinding oil, which resulted in a grinding ratio of 10.0 at 5000 sfpm, but unfortunately the heavy spark stream at this speed created a serious fire hazard and the use of an oil under such conditions is definitely not recommended. It would be a great practical advantage to be able to get at least moderately high grinding ratios at conventional wheel speeds because the conversion of existing equipment to operate at very low speeds presents many serious difficulties. If the wheel speed is reduced sufficiently to overcome the fire hazard, then the 32 Alundum wheel becomes far more suitable.

A rust inhibitor, which gave almost as high a grinding ratio as did the oil when they were used with the 32 Alundum wheel, failed completely when tried with the Crystolon wheel, the highest grinding ratio being 2.0 at 6000 sfpm. This marked difference in the grinding behavior of the two fluids when used with each of the two abrasives shows clearly the fundamental importance of the surface-chemical reactions between metal, abrasive, and fluid. Such differences cannot be explained in terms of grain, depth of cut or of mechanical forces.

Other aluminum oxide abrasives were compared with 32 Alundum abrasive, the grinding conditions being those of Table II except that the wheel speed was dropped to 1600 sfpm. The grinding fluid was a rust inhibitor in a 10% concentration, and a supplementary test with a 38 Alundum wheel showed that at this speed the grinding ratio for each of the abrasives would be close to the maximum attainable. The results for the various aluminum oxide abrasives appear in Table IV. The 57 Alundum wheel was available only in No. 5 structure, but the comparison with the No. 8 structure wheels is still valid because the effect of a change in the grain spacing corresponding to the two structures is small and erratic, as will be shown later.

The power consumed in grinding was roughly the same for the various wheels, actually being a little less for the 32 Alundum wheel than for the others. Thus 32 Alundum abrasive was clearly superior to the others because it generated slightly less heat in grinding, yet wore appreciably less than the other abrasives.

Grit Size

With the superiority of 32 Alundum wheels established, the effect of grit size was investigated under the same grinding conditions as just described. The data for two J, four K and two M grade wheels in Table V show that the grinding ratio is highest for either the 60 or 80 grit wheels, and considerably lower for both finer and coarser grit wheels. In K grade, the grinding ratio is higher for 80 grit than for 60 grit, while in M grade the situation is reversed. It is not known whether this reversal is significant or caused by some peculiarity of the 32A80-M8VBE wheel, because its grinding ratio was lower than that of a 32A80-K8VBE wheel, contrary to the effect of wheel grade found in other cases. In any event, it can be stated that 60 or 80 grit wheels should be used for surface grinding titanium.

Wheel Grade (Hardness)

The effect of wheel grade for 60 grit wheels was found to be twofold. The maximum grinding ratio increased with the hardness of the wheel, and the wheel speed at which the grinding ratio was

table IV . . . EFFECT OF TYPE OF ALUMINUM OXIDE ABRASIVE ON GRINDING RATIO

WHEEL	GRINDING RATIO
32A60-K8VBE	15.7
A60-K8VBE	11.6
38A60-K8VBE	9.8
57A60-K5VBE	9.4

table V . . . EFFECT OF GRIT SIZE ON GRINDING RATIO

WHEEL	GRINDING RATIO
32A36 - J8VBE	7.7
32A60 - J8VBE	14.2
32A46 - K8VBE	9.0
32A60 - K8VBE	15.7
32A80 - K8VBE	16.7
32A100-K8VBE	4.3
32A60 - M8VBE	15.9
32A80 - M8VBE	14.5

maximum decreased slightly. Under the grinding conditions used for evaluating the different aluminum oxide abrasive, the grinding ratios for the different grades are given in Table VI. The wheel speed, 1600 sfpm, had previously been found to give the highest grinding ratio for the K grade wheel. When the M grade wheel was tested at 1500 sfpm, its highest grinding ratio was obtained, amounting to 16.4 as against 15.9 at 1600 sfpm. Earlier experiments had shown that the grinding ratio was very low when wheels softer than J grade were used.

The proper grade of wheel to use is the hardest one that will not burn or smear the surface When the grinding fluid is a rust inhibitor, excellent results can be obtained with an M grade wheel, but it may be possible to get a further increase in the grinding ratio by going to even harder wheels, which were not available for trial. Information is lacking at present whether wheels harder than K grade will act satisfactorily with other types of grinding fluids.

Structure Number

Under the same grinding conditions that were used to evaluate the other wheel variables, there was practically no difference between the grinding ratios obtained with 32A60-K5VBE and 32A60-K8VBE wheels, but the power consumption was about 20% higher for the former. For the corresponding regular aluminum oxide wheels, both the grinding ratio and the power consumption were about 10% higher for the No. 5 structure than for the No. 8 structure wheel. Thus the grinding ratio is not affected in any clear-cut manner by this change in structure number but the No. 8 structure is preferable, at least for a 32 Alundum wheel, because less heat is generated in the work surface.

The porous structure was found to be definitely inferior to the No. 8 structure since the grinding ratio for a 32A60-JI2VBEP wheel was 25% less than for a J8 wheel and 32% less than for a K8, the latter being the wheel with which the J12 wheel would normally be compared. Thus No. 8 structure appears to be the most suitable for surface grinding.

table VI . . . EFFECT OF WHEEL GRADE ON GRINDING RATIO

WHEEL	GRINDING RATIO
32A60 - J8VBE	14.2
32A60 - K8VBE	15.7
32A60 - M8VBE	15.9

RATES OF CUT

Table Speed

The effects of changes in table speed, downfeed, and crossfeed were investigated under the grinding conditions listed in Table II except that the wheel speed was 1600 sfpm, and the rates of cut were varied as desired. When necessary, a total downfeed of more than 0.020 in. was used to get the desired accuracy. The grinding fluid was a rust inhibitor used in a 10% concentration.

As can be seen from Fig. 3, the grinding ratio was highest at about 200 ipm and then decreased steadily as the table speed was increased. The discrepancy between the value for 450 ipm in this figure and the higher value for the same grinding conditions (32A60-K8-VBE) in Table IV must be attributed to some unknown change in the condition of the surface grinder since the two tests were run about two months apart using the same wheel and the same brand of rust inhibitor.

A table speed of 450 ipm was used throughout all the other work since this made it possible to get reasonably high grinding ratios without making the runs too time-consuming.

Downfeed and Crossfeed

When the unit downfeed and the unit crossfeed were varied over a wide range, it was found that the grinding ratio dropped rapidly as either was increased. This is shown in Fig. 4, where the grinding ratios are plotted for various combinations. Some runs were also made at unit downfeeds of less than 0.0005 in. The grinding ratios were then somewhat lower than for a downfeed of 0.0005 in. but the results were erratic.

From the results of Fig. 4, it was established that for a given *volumetric* rate of feed, the grinding

FIG. 3—EFFECT OF TABLE SPEED ON GRINDING RATIO

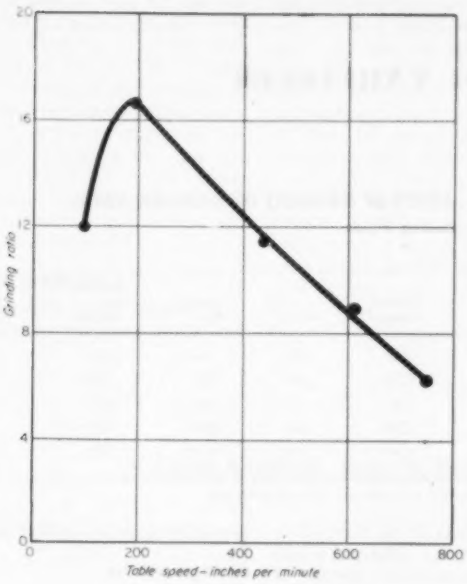
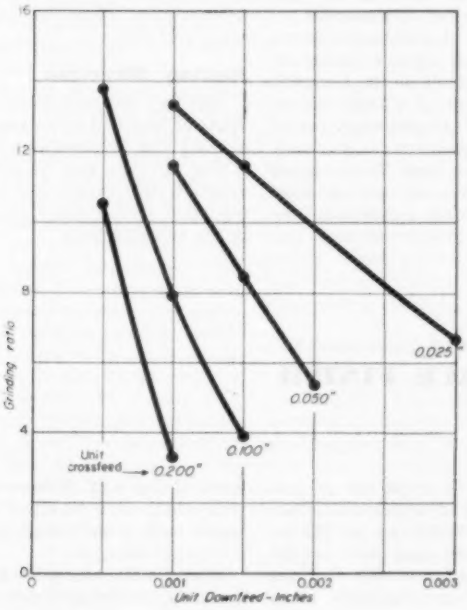


FIG. 4—EFFECT OF DOWNFEED AND CROSSFEED ON GRINDING RATIO



ratio increased with the unit crossfeed provided the unit downfeed was not less than 0.0005 in. Hence it is best to grind using a heavy crossfeed in order to get the highest grinding ratio for a desired volumetric rate of feed.

High Production Rates

The best combination of feeds and table speed to use in actual practice will depend upon the relative importance of maintaining a high grinding ratio and a high production rate. When the grinding ratio is relatively high, it may be possible to decrease it without adverse effect upon the accuracy of the work in order to improve the production rate. When very little wheel wear can be tolerated, either because the tolerances are very small or the size of the ground surface is large, moderately heavy cuts for removing most of the stock can be followed by light cuts which will minimize the wheel wear and give the required accuracy.

Since the grinding ratio is independent of wheel size, the diametral wheel wear is inversely proportional to the width and the diameter of the wheel. It is obvious that the use of as wide a wheel as can be properly placed on the spindle (a recessed wheel, if necessary) will permit grinding at the highest production rate for a given tolerance requirement. Low wheel speeds should be obtained by changing the spindle speed since most or all of the advantage gained by going to low speeds will be lost by the use of undersize wheels.

Recent Articles on Titanium

How to Work—June 11 '51, p145-153
Machinability—Oct 1 '51, p179
Douglas Stretch-Forms—Oct 29 '51, p124
Surface Grinding—Dec 10 '51, p183
Open Die Forges Cones—Feb 18 '52, p136
How to Drill—March 3 '52, p141
Grinding at Lockheed—Mar 3 '52, p175
CO_2 Cools Tools—Mar 3 '52, p129
Cutting Tests—Apr 28 '52, p91-96
How to Weld—May 26 '52, p93-97
Alloy-Sheet Welding—May 26 '52, p 98-99
Spinning Titanium—June 23 '52, p137
Torque Teaches Ti Tapping — Sept 29 '52, p102-104
Welding Titanium—Oct 13 '52, p123-125
Turning Tests—Oct 13 '52, p130-134

TITANIUM VARIABLES

Hardness

In the course of this work, a number of tests were run on a variety of titanium alloys, including commercially pure titanium, Ti-75A, and three samples of RC-130-B at different hardness levels. The grinding ratios obtained with four representative grinding fluids are listed in Table VII.

These results were obtained under the conditions given in Table II, the wheel speed being 2500 sfpm. The soluble oil and the rust inhibitor were used in a 10% concentration. These, as well as the grinding oil, were among the high-ranking ones in their respective groups. Any discrepancy between the grinding ratios for Ti-150A appearing in this table and those cited earlier was due to minor variations in test conditions.

Examination of the table reveals that an increase in the hardness of the titanium decreased the grinding ratio in a manner that depended on the relative suitability of the fluid. There was relatively little effect with water, but the drop became increasingly pronounced as the suitability of the fluid improved. Looking at it another way, the harder the material, the less was the difference between the effectiveness of the fluids. It is believed that the behavior would have been essentially similar if the rust inhibitor and the grinding oil had been tested at a lower speed than 2500 sfpm, corresponding to the peak of the curve of grinding ratio vs. wheel speed; however, sufficient material was not available for this purpose.

The effect of hardness is unexpectedly great since a change of only a few points on the Rockwell C scale results in a large change in the grinding ratio when any of the recommended types of grinding fluids are used. These results show that an upper hardness limit should be set for commercial titanium alloys in order to avoid unnecessary grinding difficulties.

table VII . . . EFFECT OF HARDNESS ON GRINDING RATIO

For Various Grinding Fluids

Material					
Alloy	Rockwell Hardness	Water	Soluble Oil	Grinding Fluid Rust Inhibitor	Grinding Oil
Ti-75A	B82	2.0	—	13.5	17.0
RC-130-B	C32	1.4	5.6	9.3*	9.0
RC-130-B	C37	1.5	3.4	5.0	4.8
Ti-150A	C38	1.4	3.3	4.7	5.2
RC-130-B	C42	1.4	2.5*	3.1	2.5

*Estimated from data of a different fluid of same type

Composition

RC-130-B and Ti-150A contain entirely different alloying elements, but the grinding ratios are essentially the same when the two alloys are at the same hardness level. Perhaps this will also hold true for other alloys that may become available.

Rolling Direction

Although the mechanical properties of rolled titanium measured parallel and perpendicular to the rolling direction may be different, careful tests showed that the grinding ratio was exactly the same in the two directions.

SURFACE FINISH

Grinding for Stock Removal

The smoothest finish is generally obtained when the grinding conditions are such as to produce a high grinding ratio. Profilometer readings of 35 to 45 mu in. rms were readily obtained with either a 32A60-K8VBE or a 32A60-M8VBE wheel used with a rust inhibitor solution at 1600 sfpm, the other grinding conditions being those of Table II. Similar results were obtained with the K grade wheel used with a high-ranking straight grinding oil.

When the K grade wheel and the rust inhibitor solution were used,

the Profilometer reading dropped to 25 mu in. rms, if the unit downfeed was kept at 0.001 in. and the unit crossfeed was decreased from 0.050 to 0.025 in. or if the unit crossfeed was kept at 0.050 in. and the unit downfeed was reduced to 0.0005 in. The same finish was also obtained without changing the feeds but increasing the speed of the M grade wheel to 2000 sfpm. The finishes became progressively poorer as either or both of the unit feeds were increased.

Finish Grinding

To get even better finishes, it is necessary to diamond dress the wheel fine in the usual manner for finish grinding, and to take special measures to avoid the formation of deep isolated scratches or "fish-tails" that mar the appearance of the surface and may spoil it for its intended use. There is no difficulty in obtaining a Profilometer reading of 15 mu in. rms or less after the wheel has been dressed for finish grinding, but the elimination of the "fish-tails" may offer considerable difficulty.

One method that worked was to use a 32A60-M8VBE wheel at 2000 sfpm in conjunction with a carefully filtered rust inhibitor solution, the unit crossfeed and downfeed being 0.025 and 0.0001 in. respectively. A reading of 16 mu in. rms was obtained in this manner. At higher feeds or lower speeds, a few "fish-tails" inevitably appeared. Going to finer grit sizes did not improve the situation in any respect. Further study may reveal how to finish grind successfully at the same speed that is most suitable for stock removal, but at present, if rough and finish grinding are to be done at the same speed, as is obviously desirable, it will be necessary to be satisfied with a somewhat lower grinding ratio than the maximum in order to avoid "fish-tails."

ABRASIVE RECOMMENDATIONS

Grinding at Low Wheel Speeds

For surface grinding, using the periphery of the wheel, a 32A60-M8VBE wheel will be highly satisfactory for removing stock when used at 1600 sfpm with one of the rust inhibitors (10% concentration) listed in Table III. The wheel speed should be raised to 2000 sfpm, if "fish-tails" are to be avoided in finish grinding. A 32A60-K8VBE wheel used at 1800 sfpm with a straight grinding oil listed in the same table will give comparable results. It may be possible to use even harder grades of wheels but this has not yet been investigated. The wheel wear will be considerably greater, even under the most suitable grinding conditions, if the highest ranking soluble oils or synthetic compounds are used. Although the results that have been described were obtained with ½ in. wide wheels between 6- and 8-in. dia, some work elsewhere has shown that very similar recommendations hold for surface grinding operations with larger wheels.

The same general principles apply to other precision grinding operations with vitrified bonded wheels. For example, it has been found recently that internal grinding of titanium parts is done best at wheel speeds below 2000 sfpm. One job worked well when a 32A46-J8VBE wheel was operated at 1700 sfpm with a 10% solution of a commercial rust inhibitor. Reciprocating the wheel during grinding resulted in less loading than when plunge grinding was used.

Preliminary indications show that cylindrical grinding also benefits from the use of low wheel speeds. Although optimum conditions are not known, a 32A60-L5VBE wheel gave better results at a speed of 2700 sfpm than at the conventional speed of 6000 sfpm.

Conventional Grinding

It is realized that there are many practical difficulties standing in the way of changing over to low-speed precision grinding, and many efforts have been made to find a satisfactory method of grinding titanium at conventional speeds. Thus far, all efforts along this line have failed on account of the peculiar grinding characteristics of titanium. Whether low speeds are

table VIII . . . SUGGESTIONS FOR GRINDING TITANIUM

At Conventional Wheel Speeds

Type of Operation	Wheel Specifications	Wheel Speed sfpm
Surface grinding, wet:	32A46-I8VBE	6000
Cylindrical, wet:		
light cuts	32A60-J8VBE	6000
heavy cuts	32A60-K8VBE	6000
Cutting off, wet:		
1¼" bar stock and smaller	37C60-POR-30	9500
larger than 1¼"	37C46-MOR-30	9500
Cutting off, dry: (only if wet method cannot be used)	A54-L8B	9500
Snagging:		
swing frame	A14-Q4B7	9500
portable grinder	A16-Q4B7	9500
Offhand, dry:		
bench stand	A36-K8VBE	5500

likly to be of any benefit in constant-pressure operations like snagging is not yet known.

When the grinding operation is to be performed in the conventional range of wheel speeds, the suggestions in Table VIII are the best available at present. In wet operations, it will probably be helpful to use a rust inhibitor in a 10% concentration for the grinding fluid in place of the soluble oils that would normally be used, since there is evidence that even at 6000 sfpm, the wheel wear will be appreciably less when the rust inhibitor is used.

Barrel Finishing

Over 10,000 titanium jet engine blades were tumbled to improve the surface finish. Starting with a sandblasted finish of approximately 100 mu in. rms, it was possible to obtain 16 to 20 mu in. rms readings.

A Murco two-compartment, horizontal, octagonal barrel with compartments each 15 in. wide by 30-in. dia was used. A mixture of 200 lb No. 2T and 300 lb No. 3T Alundum tumbling abrasive was placed in each compartment with 4 oz of Monsanto Santocel and 1 lb of Permag No. 39. Blade load varied with blade size from 250 to 800 per compartment. Water was added to come within 4 or 5 in. of covering the load. The barrel speed was 20 rpm. Time cycle was 10 hours.

At the end of the cycle the parts were rinsed thoroughly in the barrel, unloaded, and dipped in a 2% solution of Enthone Compound NR-37 to protect the finish. Care was taken in unloading to prevent nicking. The use of a canvas boot attached to the barrel permitted the blades to slide into the box without being nicked.

Polishing and Buffing

Offhand polishing can be accomplished on some pieces with a cork resinoid wheel, A801-G20BC10, operated at 5500 sfpm.

Titanium scale can be removed with a cloth set-up wheel operating at 5500 sfpm. The canvas wheel is coated with 180 Crystolon B grain using Iding SDXRI polishing cement or the equivalent after it has been sized with Iding SDXR sizing cement or equivalent.

Discoloration

Discoloration can be removed from commercially pure titanium sheet (and probably from alloy sheet) in a similar way except that the canvas wheel should be coated with 240 E1 Alundum B grain. Some unavoidable wheel loading may occur.

A still finer finish can be obtained by buffing after polishing with the set-up wheel. A cloth buff coated with 240 E1 Alundum B grain mixed with stearic acid works satisfactorily.

COMING NEXT WEEK...

American Machinist

75th anniversary issue

MID-NOVEMBER, 1952

WHAT'S AHEAD THE NEXT TEN YEARS IN METALWORKING

For once production men have dared to make long-term forecasts. From the ideas and plans of hundreds of men, the editors of *American Machinist* have compiled detailed, technical forecasts in these ten fields:

- **materials & components**
- **casting & molding**
- **tools & tooling**
- **presswork & forging**
- **machining**
- **joining & assembly**
- **heat-treating**
- **finishing**
- **inspection & testing**
- **plant services**

To complete the picture there is an economic forecast of metalworking activity for the next decade. The *American Machinist* Index has been extended to show the development of Metalworking over the past 75 years. Among the other highlights are more than 250 of the best ideas presented in popular departments over the years.

All combined in a precedent-shattering form as an extra issue—a birthday present to our readers—the *American Machinist* 75th Anniversary Issue

Investment Castings Need Not Be "Free-Machining" Stainless

Machinability tests conducted under controlled conditions prove that the differences in machinability of the various grades of stainless are of far less importance than castability

BY RAWSON L WOOD, President, ARWOOD PRECISION CASTING CO and DAVIDLEE VON LUDWIG Consultant, BROOKLYN, N Y

Considerable divergence of opinion exists concerning the relative machinability of the investment-cast stainless steels in various grades. The fact that a particular alloy is "free machining" in the forged or rolled condition predisposes individuals to presume that it is just as machinable in the cast condition.

Very few comparative tests have been made on a sound basis to determine the actual differences among the various stainless steel alloys now used in the investment-cast form. To secure independent, reliable data, the Arwood Precision Casting Co manufactured samples from heats of Types 410, 416, 303 and 304 steel. Milling samples only were made from a melt of Type 302 steel. Types 416 and 303 are nominally the free-machining forms of Types 410 and 302-304, respectively. These coupons were sent to the University of Michigan, where tests were performed by W W Gilbert, professor of production engineering.

With the exception of Type 302, the following studies were made on the various investment-cast blanks; 1) comparative forces in turning; 2) comparative drilling torque and thrust tests; 3) comparative milling energy tests; and 4) tool-life tests. The Type 302 steel was tested only for milling.

The test results tend to corroborate the broad premise previously expressed in the trade: the differences in machinability are not sufficient to serve as an important basis for selection of the metal for an investment-cast product.

Tool Forces in Turning

Two force components — tangential and feed — were measured when turning annealed Types 303, 304, 410 and 416. These tests were made to determine whether free-cutting properties existed. The ⅝-in. dia by 6-in. specimens were held in a collet. Small size of the specimens restricted the cuts to 0.050 in. depth and 0.005 ipr feed. A cutting speed of 30 fpm was used without coolant or lubricant. Even so, the limited depth and feed exceeded those which are normally recommended for finishing investment castings. The absolute maximum finish allowance recommended for large investment castings is only 0.040 in. and the normal investment casting allows only 0.025 in. for finish.

The 18-4-1 tools were ground to 8° back rake, 14° side rake, 7° end relief, 7° side relief, 60° end-cutting-edge angle and 0° side-cutting-edge angle with a chamfer 0.036 in. wide at 60°. Results are reported in Table I. The chip thickness was measured to ascertain the chip-thickness ratio. This ratio is the thickness of the chip before cutting, as indicated by the effective depth of feed, divided by the chip thickness as it is measured after cutting. Knowing this ratio assists in formulation of force and efficiency comparisons. Computations were also made, using Merchant's analysis, of the coefficient of friction, the shear angle, the shear strength, the work of friction, the work of shear, and the total work or hp/cu in. per min.

Type 416 steel had better machinability than 410. The lower cutting and feeding forces, the lower coefficient of friction on the tool face, the lower work of friction, and the lower total work all indicate some superiority of 416 in comparison to 410 in the investment-cast form. However, the differences are not equivalent to those secured in annealed alloys in the forged or rolled structures.

There are only small differences between Types 303 and 304 with respect to relative ease of turning. Type 303 has a lower coefficient of friction, but most of the other values were slightly in favor of Type 304, a non-free-machining stainless steel.

These indications sustain the belief that the effect of selenium upon

Table I—TURNING TESTS ON INVESTMENT-CAST STAINLESS STEELS

Alloy	Force (cut) Lb	Force (feed) Lb	Coef. of Friction	Chip Ratio	Shear		Unit HP (HP/cu in./min) Work of Friction			Work of Shear			Total Work	Surface Finish, Rms
					Angle	Strength	Force	Val	Unit	Force	Val	Unit		
303	121	75	1.06	0.500	28.8°	140,000	100	15	0.507	70	30.2	.723	1.23	70-120
304	119	65	0.921	0.625	35.5°	130,000	95	18.8	0.60	59.2	31.2	.62	1.21	40-90
410	119	65	0.921	0.625	35.5°	130,000	95	18.8	0.60	59.2	31.2	.62	1.21	60-95
416	96	40	0.742	0.500	28.8°	125,000	60	15	0.304	65	30.2	.666	.97	60-110

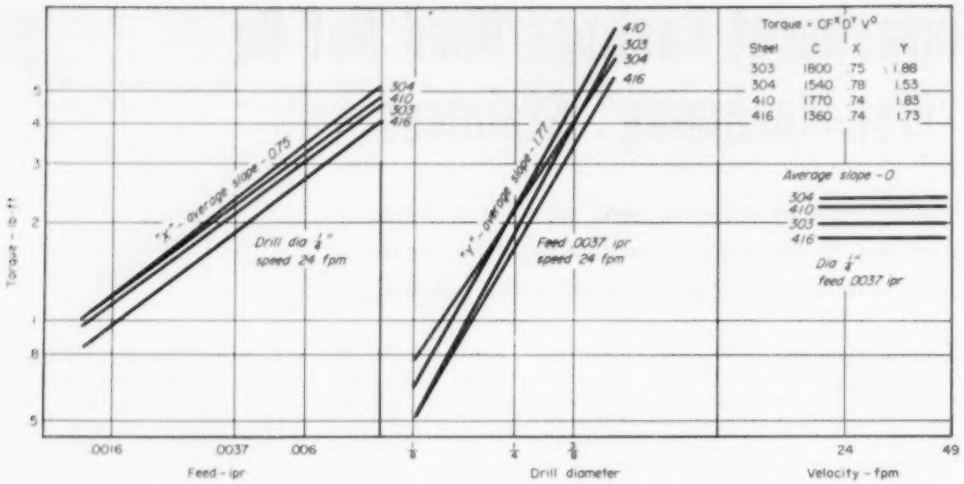


Fig. 1—Drilling torque is somewhat higher for the non-free-machining steels, but since most holes are cored in investment castings the important criterion is to use maximum feed consistent with tool endurance in order to avoid work hardening

machinability of the 18-8 stainless steel is suppressed in the investment-cast form, whereas the effects of sulphur on the machinability of the martensitic stainless steel are not lost. Type 416 is relatively free machining compared to Types 304 and 410, but the advantages of this are suppressed by low tool life.

Effect of Sulphur

Failure of sulphur to produce free-machining characteristics in the experimental heats of 303 cannot be attributed to a major difference in normal form of retention. On the other hand, the effect of a substantial part of the sulphur was lost as the result of chemical reaction between it and the nickel in the alloy.

Surface finish of the turned specimens was measured after making further turning cuts, Fig. 1, using a HSS tool ground, 8°, 14°, 6,° 6°, 6°, and 15°, 3/64 in. chamfer, using the same depth of cut, 0.050 in. and the same feed of 0.005 ipr. Micro-inch roughness values are shown in Table I. Non-free-machining alloys, 304 and 410, had better surface finish than the free-machining types, 303 and 416. This seems to indicate that the sulphur or selenium modifiers are ineffective in improving finish.

The free-cutting properties of types 410 and 303 definitely reduced the thrust at light feeds and also reduced the drilling torque, as compared to the non-free-machining grades, 410 and 304. There was less difference between the free-cutting and standard alloys, when heavier feeds and larger diameter drills were employed, as shown in Table II. This consideration is important in the utilization of these alloys in investment-cast form.

To avoid work hardening it is normally recommended that you employ the heaviest feed consistent with the over-all mass and strength of the cast product. Tool endurance often constitutes a more important machinability factor than theoretical considerations of forces involved. This is particularly true in attempting to finish deep, rough cast holes. Any interruption in the cut may seriously affect the final accuracy and finish of the hole being produced.

For drilling tests, the feeds used were 0.0016, 0.0037 and 0.006 ipr, when using a ¼-in. drill at 362 rpm or 24 fpm.

Drills of ⅛ and ⅜ in. were also tested at speeds of 24 fpm and feeds of 0.0037 ipr. Two cutting speeds were used with the ¼-in. drill 24 and 49 fpm, with a constant feed of 0.0037 ipr to find the influence of cutting speed on drilling power.

Results of the Drilling Tests

Curves of drilling torque in pounds-feet are plotted in Fig. 1 against feed, drill diameter and cutting speed. These show the results of tests run on Types 304, 410, 303, and 416. In Fig. 2 the thrust is similarly plotted.

At light feeds or with the ⅛-in. drill, Type 304 and 410 steels produced higher torques and thrusts than was the case with Types 303 and 416. Table II summarizes the torque, thrust and hp/cu in. per min values secured with the ¼-in. drill at a light feed of 0.0016 ipr and a heavy feed of 0.006 ipr for the four steels.

Milling Energy Tests

Free-cutting properties of the modified steels reduced the energy requirements when using light cuts. With heavier depths and feeds there was less variation between the steels. This might be of practical importance in finish milling delicate investment castings, where normally the maximum finish cut is 0.012 in. in depth and the average roughing cut about 0.025 in. The heavier depths of cut employed in the tests run by the University of Michigan were unrealistic in their applicability to production investment castings.

The milling energy for each of

five steels is plotted in Fig. 3, and summary is given in Table III. Values of energy when using a feed of 0.010 ipt and a depth of 0.150 in. show that the free-cutting steels require less energy than the non-free-cutting steels such as 304 and 410.

In Fig. 3 notice that where the lightest cuts of 0.050 in. depth and 0.005 ipt were used, the non-free-machining steels show high values of milling energy. This indicates work hardening was encountered with a subsequent increase in energy level. The 304 steel required unusually high energy levels compared with Type 303. Heavy cuts, using a depth of 0.150 in., showed less difference between steels.

Tool-Life Tests

Tool endurance was determined by turning $\frac{5}{8}$-in.-dia by 6-in.-long bars. Here, again, the depth employed, 0.050 in., and the feed of 0.005 ipr, while "light" in comparison to finishing cuts employed on massive parts, were in excess of the

Table II—COMPARATIVE TORQUE AND THRUST IN DRILLING

Alloy	Torque, Feed 0.0016	Lb-ft Feed 0.006	Thrust, Feed 0.0016	Lb Feed 0.006	HP/cu in./min Feed 0.0016	Feed 0.006
303	1.15	3.125	114	308	2.79	2.06
304	1.25	3.50	175	321	3.10	2.27
410	1.25	3.25	155	347	3.03	2.10
416	1.00	2.75	121	309	2.43	1.77
			Percentage Comparison			
303% 304	91	89	65	96	90	90
416% 410	80	85	78	89	80	84

Drills: HSS, 30° helix, 118° point angle, 120° chisel edge angle
Cutting Speed: 24 fpm
Drill Dia: $\frac{1}{4}$ in.

Table III—SUMMARY OF MILLING-ENERGY TESTS

Alloy	x	y	C	E* ft-lb	HP/cu in./min*
302	0.65	0.94	1680	11.9	1.28
303	0.73	0.92	1828	9.0	0.97
304	0.75	0.75	1625	10.1	1.09
410	0.61	0.96	1150	9.3	1.00
416	0.66	0.88	1160	8.5	0.92

$E = C\ f^x\ d^y$
*d = 0.125 in.
F = 0.010 ipt
w = 0.225 in.
$Hp = E/33000\ fd^w$

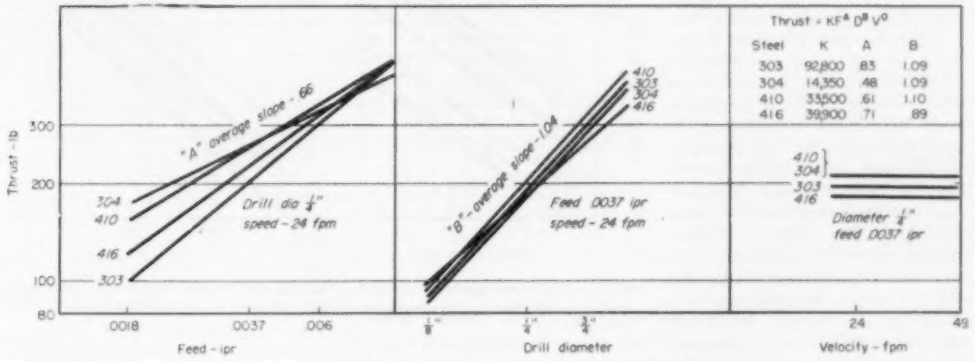


Fig. 2—Thrust values for drilling the various grades of stainless are very nearly alike at the heavier feed rates

Table IV—RELATIVE MACHINABILITY OF STAINLESS STEELS

Alloy	Cutting Forces: Lathe Turning					Drilling			Milling		Tool Life: Turning	
	Force (cut) Lb	Force (feed) Lb	Coef Fric	HP/cu in. per min.	Surf Fin Rms	Torque Ft Lb	Thrust Lb	HP/ cu in. per min.	Energy Ft Lb	HP/cu in./min.	V10	T130
303	121	75	1.06	1.23	70-120	2.00	196	2.08	9.0	0.97	143	24.0
304	119	65	.92	1.21	40-90	2.31	218	2.42	10.1	1.09	116	3.6
410	119	65	.92	1.21	60-95	2.23	224	2.35	9.3	1.00	133	12.5
416	96	40	.74	.97	60-110	1.78	197	1.89	8.5	0.92	94	0.6
302									11.9	1.28		
	f = 0.005 ipr d = 0.050 in.					f = 0.0036 ipr d = ¼ in.			f = 0.010 in. d = 0.125 in.		f = 0.005 in. d = 0.050 in.	

maximum normally required to finish an investment-cast part. The HSS tools were operated dry at various speeds until total failure occurred. Failure was designated as 0.030 in. flank wear. Tool-life values are plotted on log-log paper so that the slope of the lines represents the value of n in the equation $VT^n = C$, where V is the cutting speed in fpm, T is the tool life in minutes. There was no difference in the slopes of the tool-life lines.

Results of Tool-Life Tests

The most unusual result of these tests was that Type 416 steel gave a much shorter tool life than expected. On cutting-force tests, this alloy had been superior to Type 410 steel. With respect to tool life, however, Type 416 is inferior to Type 410 and also to Types 304 and 303. It is probable that some abrasive constituent is present in this alloy to cause the excessive tool wear.

If the foregoing results of tool endurance are applicable to milling and drilling, and they should be, then the practical effects of some of the differences in energy requirements cited are substantially negated where precision finishing with light cuts are normally encountered in milling and where finish drilling of small, comparatively deep holes is necessary. In these operations the endurance of the tool may be more important in securing the required tolerance than any theoretical ease of metal removal. The higher surface smoothness which is secured with the unmodified alloys, Types 304 and 410, places an additional emphasis on the normal preference for these metals as investment cast.

Conclusions

Performance of the various investment-cast stainless steels was comparatively listed by the University of Michigan on the basis of their tests as: in the order of energy consumption, 416 best, followed by 303, 410, 304 and 302. Considered from the tool-life viewpoint, this order is changed. Type 303 is best, then 410, 304 and 416. Type 302 was not evaluated with the question of tool life in mind. It probably would be close to type 416 in this respect, but above it in the scale. Table IV summarizes the tool-life and cutting-force tests.

There are some instances in design where the maximum ease of finishing must be obtained in investment-cast metal. Trade preference, from the consumer's viewpoint, is the Type 416 stainless. From the foundry's viewpoint, in the absence of positive information to prove the advantage of using the "free machining" grades, Type 410 is the preferred alloy. Of all the stainless steels, the foundry preference is for Type 302. However, the processing of Type 304 constitutes no problem for most investment foundries equipped with induction melting furnaces.

The relatively slight advantage of ease of machining between Types 303 and 304 is so open to question, even in the light of these tests, that substantial corroboration of past recommendations to avoid selection of the free-machining grade for investment-casting purposes is still pertinent.

The normally apparent ease of metal removal in processing Type 416 investment castings obscures the fact that short tool life is encountered. Finish roughness is a factor that may not be recognized. Both of these details can completely offset the nominal gain arising from a comparatively small gain in rate of metal removal.

In selection of an alloy for an investment casting, the paramount basis remains that of foundry characteristics. Importance of machinability will not ordinarily be more significant than from 1 to 5% of the final piece price, but relative castability might well rise as high as 80%.

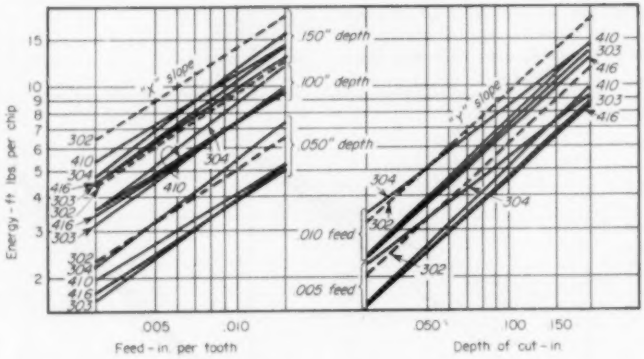


Fig. 3—At light feeds per tooth and depth of cut, the non-free-machining steels require more energy to mill than the free-machining grades, indicating a work hardening effect from too light a cut

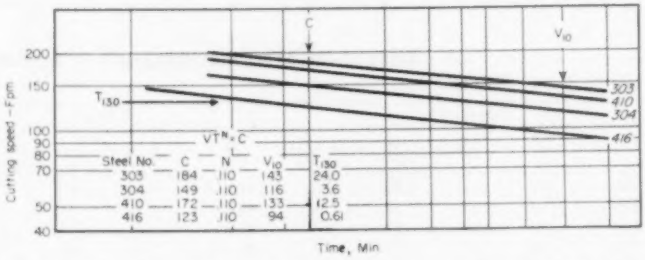


Fig. 4—Tool life of free-cutting 416 stainless is surprisingly lower than the other steels. Since tool life is normally the most important factor, in order to hold tolerance and finish, the non-free-machining steels are probably the better choice

why and how:

WE MUST CONSERVE DIAMOND BORT!

Here is the story behind the precarious balance in supply and demand for diamond bort. Data on the alternate methods available for grinding tools are summarized

BY ANDERSON ASHBURN, ASSOCIATE EDITOR

CRUSHING BORT—the diamond fragments from which diamond grinding wheels are made—should be a matter of serious concern to industry today. Despite a high level of imports, the supply is tight. And there is little prospect that it will be anything but tight in the years ahead. Best hope for relieving the pressure lies in the other methods that are being developed, methods that may prove to be at least as good as diamonds for some operations.

Ralph S Howe, director of the Metalworking Equipment Division of NPA, warns that industry must recognize three facts about the crushing bort supply: first, the problem is real; second, there is only a partial solution on some applications and no known solution on others; and third, it will be a continuing problem — not a temporary one. By moving now to try the alternate methods (they are reviewed later in this article), plants may accomplish two things: they will be prepared should restrictions have to be placed on the end uses of diamond wheels, and they will increase the chances that such controls won't be needed.

Scare buying brought on by the memories of World War II created an artificial shortage following the outbreak of war in Korea, but this has been largely brought under control by the NPA orders controlling inventories.

The shortage we face today, and will face into the future, is the result of fundamental shifts in the supply-demand relationship. Practically all the crushing bort comes from the Belgian Congo (and the largest part of the world supply comes to the United States).

Imports of bort of all types (all diamonds of other than gem quality are properly referred to as bort, those suitable for use only as fragments are crushing bort) amounted to 11 million carats in 1950 and 12 million carats in 1951, of which a portion was for the stockpile. Crushing bort was a substantial part of these imports. This year total imports of crushing bort and powder will be higher than last, but for the last quarter might be something less than 1,800,000 carats.

Prior to the advent of the carbide tool, there was a limited demand for crushing bort. With the growth of carbide tools, and with the diamond wheel the accepted method of grinding carbide, demand has mounted. Today about 65% of the crushing bort is consumed in grinding tools and cutters —about 50% for grinding single-point tools and chipbreakers.

Increases in the use of cutting tools thus bring an increased demand for crushing bort. In the first part of this year sales of such tools were 67% higher than in the same period in 1951, bringing an increasing demand for diamond wheels.

Today the relationship between supply and demand is precarious. Any substantial increase in the production level—or any interruption of supply such as a war that brought shipping under attack — could destroy the balance.

Though there may be no solution to the supply problem, there

NPA ORDERS AFFECTING CRUSHING BORT

NPA Order M-102 (Crushing Bort, Diamond Powder or Dust, and Unreclaimed Diamond Material): Requires monthly reporting by all consumers, reclaimers, importers, dealers, brokers, and other holders of the subject materials, of inventories, receipts, sales consumption, and quantities reclaimed; and provides that NPA may specifically direct or suspend deliveries of such diamond materials as in its discretion the circumstances may require.

Related Order — NPA Order M-103 (Diamond Grinding Wheels): Limits inventories of diamond grinding wheels to 60 days' supply; requires the use of the most durable type of diamond grinding wheel for certain types of grinding operations on carbide tools; and limits the diamond content and depth of diamond bearing surface of grinding wheels that manufacturers may produce.

WET SURFACE GRINDING WITH PERIPHERY OF WHEEL

Diameter of wheel, in.	7	7	14
Face of wheel, in.	½	½	2
Abrasive and grit size	D100	39C60	39C60
Grade	N100B	J7V	L5V
Material removed per minute, cu in.	0.0727	0.0304	0.172
Wheel wear, cu in.	0.00291	0.654	4.1
Volume ratio, material removed/wheel wear	25.0	0.0465	0.0424
Wheel cost	$5.80	$3.40	$1.70
Time, at $7.50 per hour	$1.70	$4.10	$.70
Total cost	$7.50	$7.50	$2.40

WET CENTERLESS GRINDING

Diameter of wheel, in.	20	20
Face of wheel, in.	3	6
Abrasive and grit size	D100	39C60
Grade	N100B	M5V
Material removed per minute, cu in.	0.49	0.0518
Wheel wear, cu in.	0.0117	1.48
Volume ratio, material removed/wheel wear	41.8	0.035
Wheel cost	$3.20	$2.20
Time at $7.50 per hour	$.30	$2.40
Total cost	$3.50	$4.60

is a way to cut demand. Bort is indispensable for some purposes, but for others there are satisfactory substitutes. If industry turns to substitute methods in those areas where they are practical there would be, if not no problem at all, at least much less of a problem than exists today.

If this is not done voluntarily, there seems no way to avoid severe controls on the end uses of crushing bort. Talking with NPA officials produces the impression that they have such restrictions under consideration, but are anxious to give industry every chance possible to cut the demand voluntarily.

The need is urgent for industry to learn more about the substitute methods summarized below. If they prove less economical or efficient than the diamond wheel, the knowledge would prove invaluable in a full emergency, while if they should prove more economical for some applications there would be an immediate saving in both operating costs and in the consumption of diamond bort.

Silicon Carbide

When cemented carbide tools first appeared, they were ground with silicon-carbide wheels. Then the diamond wheel was developed, found to be generally superior, and adopted for virtually all carbide grinding.

At a technical conference of silicon carbide grinding wheel manufacturers held by NPA last fortnight, the possibilities of a return to silicon carbide were reviewed. The general opinion of this conference was that silicon carbide could be used, if necessary, for most carbide tool and cutter grinding. It is not suitable for thread grinding, cut off, chipbreakers, internal jobs, most special form jobs, or for cutters over 10-in. dia (though note a report on a larger cutter below). Even in some of these areas, silicon carbide can be used for roughing, with a diamond wheel for finishing.

Offhand Grinding

Tests were reported by Norton on offhand grinding of single-point tools with a 14-in. cylinder of silicon carbide having a 1½-in. rim (39C60-18VK). Cutting rate was 5 grams of carbide per minute, the same rate obtained when wet grinding with a comparatively soft vitrified-bond diamond wheel (D100-L100V-1/16 in.) of the same diameter. Finish was not reported.

Both wheels must be dressed to maintain a proper cutting surface. The total loss of the diamond wheel in this test was only 1/85 that of the silicon carbide wheel. On the other hand, the wheel cost per unit of abrasive was about 675 times greater, making the net diamond wheel cost greater than that for silicon carbide.

It must be emphasized that this was a laboratory, not a production, test. At the same time it should be remembered that it was grinding carbide alone. In practice, rough grinding may remove shank steel as well as carbide. This wears the diamond wheel, according to Norton, seven times faster than normal.

For fixed-feed operations, a comparatively soft wheel is required. With such a wheel the dulled particles are pulled out by friction with the work, maintaining the rate of cut and keeping heat down. The tables show comparative data, reported to the conference by Norton, on surface and centerless grinding. Crowning tends to be a problem in surface grinding large areas. It can be minimized by turning to wheels of larger diameter and wider face (which means larger equipment).

A case history was reported on grinding a 20-in. dia 36-tooth milling cutter with carbide inserts 4 in. long, 1/16 in. wide. This cutter was ground on an Ingersoll cutter grinder. With a total feed of 0.008 in. in 0.002-in. increments, the carbide inserts after grinding were within 0.0005 in. of uniform height.

High Secondary Relief

A report to the conference by Bay State Abrasive Products Co pointed out that one way to save on single-point tools is to rough grind with a secondary relief 2 or 3° greater than the primary relief. This saves time and tool life on a diamond-wheel finish grind. They suggest a C-220F9-V2 silicon carbide wheel.

Problems with silicon carbide tool grinding include the absolute necessity for wet grinding and the need for greater skill on the part of the operator. This need for greater skill makes the need for rapid action all the more urgent. A plant doing any volume of cutter grinding can by experimenting now and developing the neces-

sary skill in at least a few operators, erect a valuable hedge against the day when their use of diamond wheels might be severely restricted.

A more serious problem arises from the fact that silicon carbide works best when larger wheels are used. According to the last *American Machinist* Inventory there are more than 66,000 tool and cutter grinders in the United States. To adapt any sizable portion of them to take larger wheels is a task of staggering proportions.

New Processes

A number of basically new processes have attracted attention recently (*AM*—Apr 17, '52, p130).

An electric arc tool for salvage work was developed by Louis Waidler and Gus Holfeder at Curtiss-Wright and reported in *Wings* for July, 1942. Commercial units were developed the next year. Literature was supplied the Russian Purchasing Commission in 1944 and one of the Elox machines was shipped to Russia in 1945.

Russia, plagued by grinding carbide tools without diamond bort, has pioneered in the development of the electro processes from this beginning. By the summer of 1950 there were more than 4000 electro-spark machines in use in Russia and Poland.

Electro-spark Method

The electro-sparking process (*AM*—Apr 3, '52, p136) now available (Elox, Method X) is efficient for cavity work and may be suitable for other grinding, but cannot be used for offhand grinding of single-point tools.

In operation, the work is one of the electrodes in a properly designed circuit. Rapidly pulsed current (usually oscillatory) of the spark discharge type is passed between work and electrode in a dielectric fluid. Electrode consumption is relatively high, and may run as high as three times the amount of work removed.

Electro-Arcing Process

This method, which maintains an arc between the work and a cathode, uses dc and a moderately conducting electrolyte. It is suitable for cutoff work, producing a relatively rough finish.

Electrolytic Grinding

One of the most promising of the electro processes for conserving diamond bort is electrolytic grinding (see page 154). In the "pure" process a revolving metal disk carrying steady dc and a highly conductive electrolyte would be employed. In practice, the three development projects in the United States have all settled on metal-bonded diamond wheels rather than a metal disk. There is some disagreement as to how much carbide is removed by the diamonds and how much electrochemically, but certainly diamond consumption is far less than in conventional grinding. Frankford Arsenal plans tests with a metal-bonded silicon carbide wheel.

The first tests were made in the US at Frankford Arsenal, with Norton and Super-Cut doing considerable work later. Super-Cut is now producing the rectifiers in limited quantities and providing plans for converting existing grinders to the process. Test models of grinders especially built for electrolytic grinding are aso being produced.

At Norton the attitude is that electrolytic grinding is promising, but not yet a commercial fact. They believe that commercially acceptable rates of cut can be maintained with currents of 250 amp per sq in. The erosion of adjacent edges at this current density may or may not be a problem. Preliminary tests show similar performance and life to similar tools ground with a vitrified bond diamond wheel. There can be no real answer on this, however, until more extensive tests have been made under field conditions.

Ultrasonic Process

The ultrasonic process of stock removal (*AM*—Sept 15, '52, p141) employs an abrasive action at high frequency and low amplitude. The tool is vibrated in the frequency range from 16,000 to 29,000 cycles per second through an amplitude of a few thousandths. The abrasive is usually 280 grit boron carbide in water for roughing, finer grit for finishing. Development is being made by Cavitron Equipment Co.

Surface Finish

Many of the methods described here produce finishes on the tools different from those obtained with diamond wheels. The question is: Are the finishes now accepted as standard practice necessary for good tool life, or did they become standard because they were readily obtainable by diamond-wheel methods?

Only fairly extensive tests under field conditions can give any final answer to this question. At the technical conference on silicon carbide previously mentioned, a representative of the Munitions Board stated that if finish standards are unnecessarily high the armed services will cooperate to get them on a realistic basis. This must be done, however, before the contracts are let.

Finish specifications set by the original tool manufacturer were reported to create problems for small plants doing regrind work.

Action Required Now

As indicated at the beginning of this article the present supply-demand relationship of crushing bort could easily be upset. With the variety of alternate methods that have come upon the scene, it is only common sense to begin investigating those that seem promising, to make plans for required changes of equipment, to develop the required skills in a few men at least—in short to be prepared for the blow of complete diamond bort control should future events make it necessary.

FOR FURTHER INFORMATION ON DIAMOND CONSERVATION:

How To Conserve Diamond Wheels, *AM*—Feb 18, 52, p173

Arc Machining Makes Hard-To-Cut Jobs Easy, *AM*—Mar 3, 52, p136

New Processes Will Machine the Unmachinable, *AM*—Mar 17, 52, p130

Soft Steel and Ultrasonics Machine Carbide, *AM*—Sept 15, 52, p 141

ELECTROLYTIC GRINDING...

BY L. H. METZGER, President, and GEORGE KEELERIC, Research Engineer, SUPER-CUT, INC., CHICAGO

Electrolytic grinding is based on anodic dissolution of the work. The basic nature and arrangement of the process is illustrated and described at right. The basic process is an old one. Electropickling and electropolishing use the same principles.

What makes electrolytic grinding a new process is the speed and control which is possible. Because of the small distance between tool cathode and work anode (ideally 0.0007 in.), high current densities are possible. In electropickling or polishing, a current density of 25 amp per sq in. is high; in electrolytic grinding, they may run as high as 400 amp per sq in. for carbide and 1500 amp per sq in. for steel.

To accurately control the distance between tool and work, insulating spacers resistant to abrasion must be mounted in the tool. Diamond bort is used for this purpose. To replenish the electrolyte rapidly the tool must move at high speed—thus we arrive at a diamond grinding wheel rotating at speeds similar to conventional grinding.

But the diamond wheel does not *grind* away the work—this is done by electrochemical means. In grinding carbides, the diamond spacers do remove the soft insulating oxides that form on the work. If not removed, these oxides would slow or stop the reaction. When steel is ground with solutions containing silicate or aluminate, a soft film also forms which must be removed by the spacers.

Arcing or sparking will occur if the current density is too high for the space provided. This will erode the tool and impair the surface of the work. This can happen if the operator applies too much pressure to the work, causing the diamond to bite in, and reducing the space between cathode and anode.

To prevent this, the rectifier has an electronic control that reduces the voltage when excessive sparking occurs. Arcs and sparks superimpose an alternating current on the direct current of the system. The control unit picks up this superimposed current, amplifies and rectifies it, then applies it to reduce the normal input power to the rectifier. This is done by reducing the saturation of reactors in series with the input power line.

Control action is practically instantaneous. It can be adjusted to eliminate any sparking or to allow any desired level of sparking. Normally, the control is set to permit some cold sparking, reducing the voltage so that an arc cannot be maintained.

Solutions of sodium salts have been the principal electrolyte in work to date. Initially, sodium chloride was a substantial ingredient, but because of the highly corrosive action of chlorides on machine parts, they have now been eliminated and a non-corrosive, non-toxic electrolyte is employed.

Speed

With a diamond wheel that has the proper degree of spacing, speeds should at least be no slower than in normal diamond grinding. One test in grinding a chipbreaker 0.020 in. deep, ⅛ in. wide, and 1 in. long in a carbide tool was made both electrolytically and conventionally. In each case the pressure was applied with a 1¾-lb weight. Electrolytic grinding was 7% faster than conventional grinding.

Experimental grinding of chipbreakers (also 0.020 in. deep) at the Ford Mound Road plant has resulted in grinding twice as fast with electrolytic as with diamond grinding. Other tests on face wheels have been made that indicate similar rates. We believe that the speed of metal removal will vary with the carbide and the electrolyte, but will equal or exceed the speed of diamond grinding.

Finish

With a diamond wheel in the proper condition on a machine that is running true, finishes to 4 mu-in. rms can be obtained. This finish is independent of the rate of metal removal.

However, the surface is entirely different from that obtained with diamond grinding. The surface obtained conventionally has parallel scratches or grooves with intervening peaks. Electrolytic grinding produces a surface with many small oval-shaped mounds. There is a possibility that this surface will provide less friction between tool and work than the parallel peaks of conventional surfaces. If further research should confirm this, then higher Profilometer readings would be permissible on electrolytically ground tools than on diamond-ground tools.

Cost

At this stage no exact information can be given on cost because of the limited production experience. One estimate of diamond wheel cost in conven-

WHAT IT IS
HOW TO DO IT
HOW WHEELS ARE MADE
HOW TO CONVERT GRINDERS

With the use of diamond bort growing, and supply limited, development of other methods for grinding carbide tools becomes more urgent. Here is a full report on a method of electrolytic grinding that requires but does not consume diamond bort. Existing equipment can be converted; other metals can be ground

tional carbide tool grinding was $107.87 per cubic inch of carbide removed when grinding chipbreakers. This estimate was made nearly a year ago.

In tests of electrolytic grinding with a 6-in. metal-bonded wheel, 0.114 in. thick, a cubic inch of carbide was removed—half at 0.020 in. per pass and half at 0.040 in. per pass. Wheel wear was 0.001 in. on the diameter, indicating a wheel cost of 68 cents.

Incidentally, the work was 1 in. long and the time for the 0.020 in. pass averaged 36 sec and for the 0.040 in. pass averaged 77 sec.

No additional training of personnel is required, so that the only costs other than diamond wear are the machine, rectifier, electrolyte, and power. Power required should not exceed 8 cents in removing a cubic inch of carbide.

The original cost of electrolyte is small and one machine has now been used with the same fluid for several months without loss of efficiency. Operating costs, based on this test, would then appear to be 76 cents, excluding labor and fixed charges.

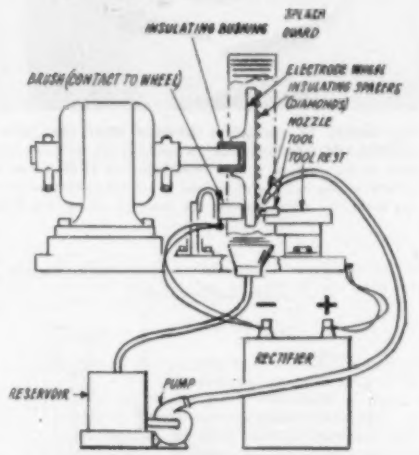
Fixed costs of a machine (or the conversion of an existing machine) and rectifier, will depend on the initial costs of this equipment and the extent to which they are used.

Problems

A rounded edge may occur on the tool, usually on the top edge where the electrolyte first hits the tool. This rounded edge is slight and whether or not it is a problem will depend on the attitude towards rounded edges — some carbide engineers prefer them, some don't. In addition, some carbides have been found to erode on the top of the tool for a short distance back from the edge.

Further development may lead to operating procedures or electrolytes that will prevent both the erosion and the rounded edge. At present they can be retarded, perhaps eliminated, in those cases where they occur by dipping the tool in a brittle quick-drying shellac before grinding. An alternate method is to dip the tool as an anode in a sodium silicate solution for several seconds.

Electrolytes are probably the biggest question mark at present. Sodium silicates are non-corrosive but do not remove metal as fast as sodium salts, or the stronger acids. Rate of metal removal also varies with different carbides as well as with different electrolytes. Although a non-toxic, non-corrosive electrolyte has been found, research must continue for a suitable electrolyte that can be applied universally.



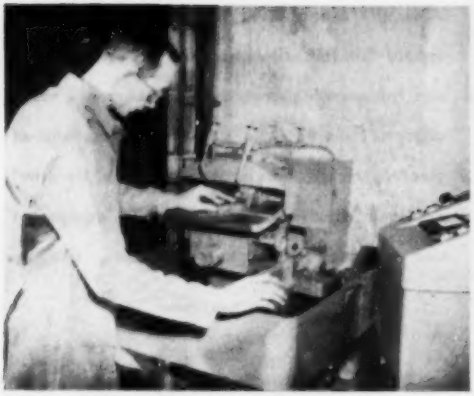
THIS IS ELECTROLYTIC GRINDING: Rectifier of special design supplies current, controlled to give maximum voltage suitable for operation, to wheel and work. Insulated wheel is connected to negative terminal through a brush, protected from splash, while the work is connected to positive terminal through the machine table. A space, generally less than 0.001 in., is maintained between wheel and work by insulating spacers on the wheel, such as diamond bort. An electrolyte—a conductive salt solution—is applied in the area between the spacers. Metal or metal carbides are dissolved from the work as salts or oxides and carried off by the electrolyte. Because of the small space which current must cross, high current density is possible, making possible rapid, controlled "grinding" of the work

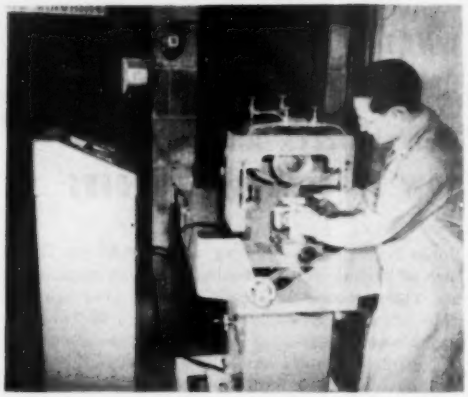
It may prove advisable to filter the electrolyte to remove oxides that accumulate. These may clog the machine unless flushed off periodically.

Tool Life

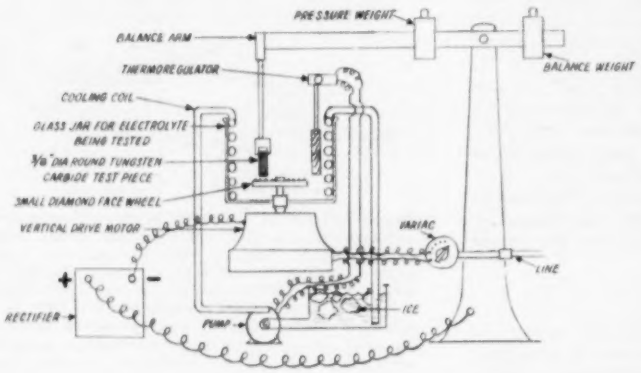
A final problem remaining unsolved is the life to be expected from tools ground electrolytically in comparison with that of diamond-ground tools. Several tests have reported that the life is no shorter, but they represent short runs and can hardly be considered conclusive. Russian literature claims the tool life is two or three times as great with electrolytic grinding. By now there are perhaps a dozen plants that are experimenting with this process and real data on tool life should soon be available.

PLEASE TURN PAGE





TEST MODEL OF HAMMOND GRINDER BUILT ESPECIALLY FOR ELECTROLYTIC GRINDING: Spindle bearings are insulated from the body of the machine; a steel wheel mounted at the center of the spindle running in a cup of mercury to provide contact for the negative lead. This design replaces the insulated wheel mountings and brush contacts required for converted machines. The view at left shows the end of spindle for face grinding; the other view, the end for edge grinding of chip breaker. The latter is done at present with conventional diamond wheels although the single layer wheels can probably be made for this purpose.

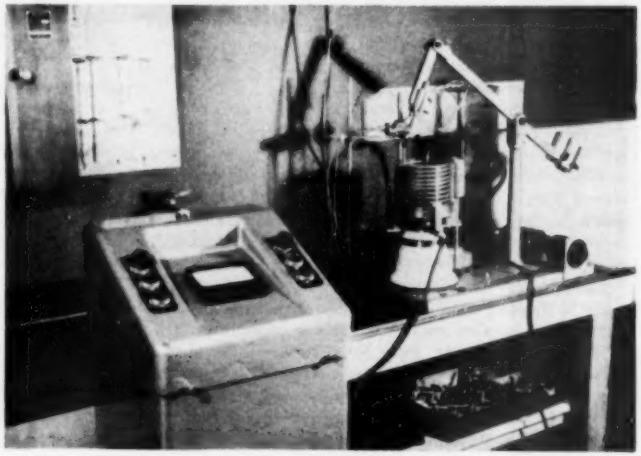


LABORATORY EQUIPMENT for testing different electrolytes under controlled conditions. Tests are made at different speeds, with electrolytes at different temperatures. Diamond face wheel (about 3-in. dia) has stepless speed control. Carbide test rod is applied to wheel with pressures adjustable by weights on the balance arm.

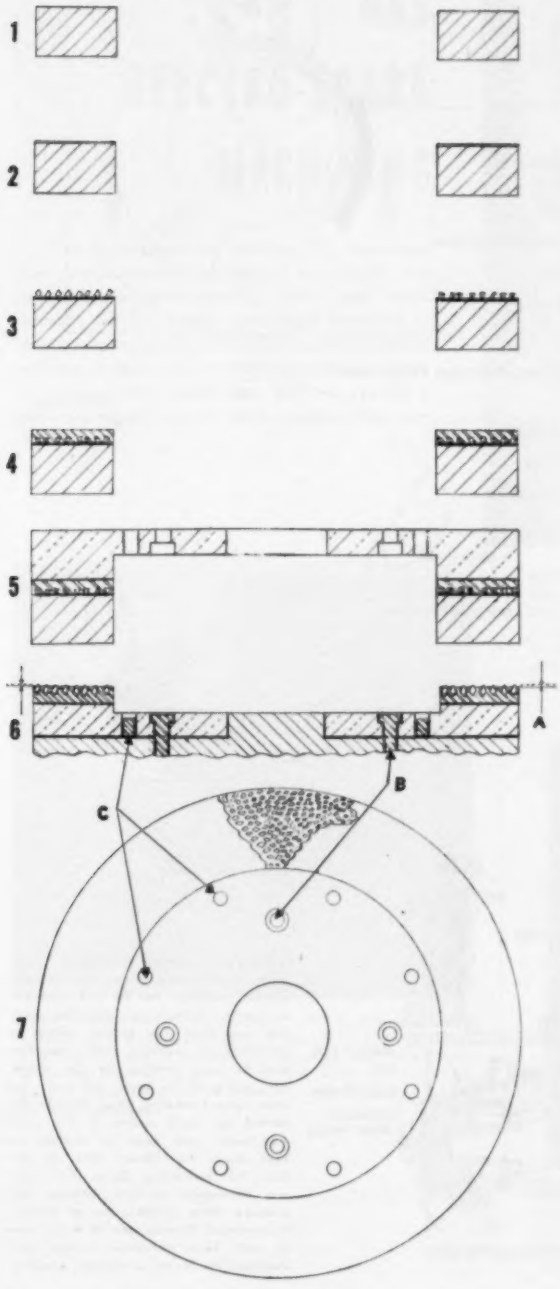
To date test results show that, for a given electrolyte, wheel speeds have little effect on rate of metal removal, that pressure of the work against wheel need only be enough for diamonds to scuff off oxides, and that chilled electrolytes slow the rate of metal removal.

Grinding Other Metals

Electrolytic grinding grinds the usual mild and high speed tool steels even more efficiently than it does carbides. In so doing it gives practically an electro-polished finish. The single layer diamond wheel described herein can now be made in various forms for form grinding. Recently the equivalent of 6000 twist drills of high speed steel, $\frac{3}{8}$" diameter, were ground electrolytically with no measurable wear on the diamond wheel. Excellent cutting edges and finishes were provided without costly shut down time for dressing regular grinding wheels.



HOW TO CONVERT CARBIDE TOOL GRINDERS TO ELECTROLYTIC GRINDING



1 Start is made with a steel ring (shown in cross section) the top and bottom surfaces of which are ground parallel.

2 A minute film of adhesive is placed on the top surface of the ring. This film is so thin it has not been successfully measured.

3 Diamond particles are plated on the film, with their distribution mechanically and evenly controlled. Adhesive is then baked.

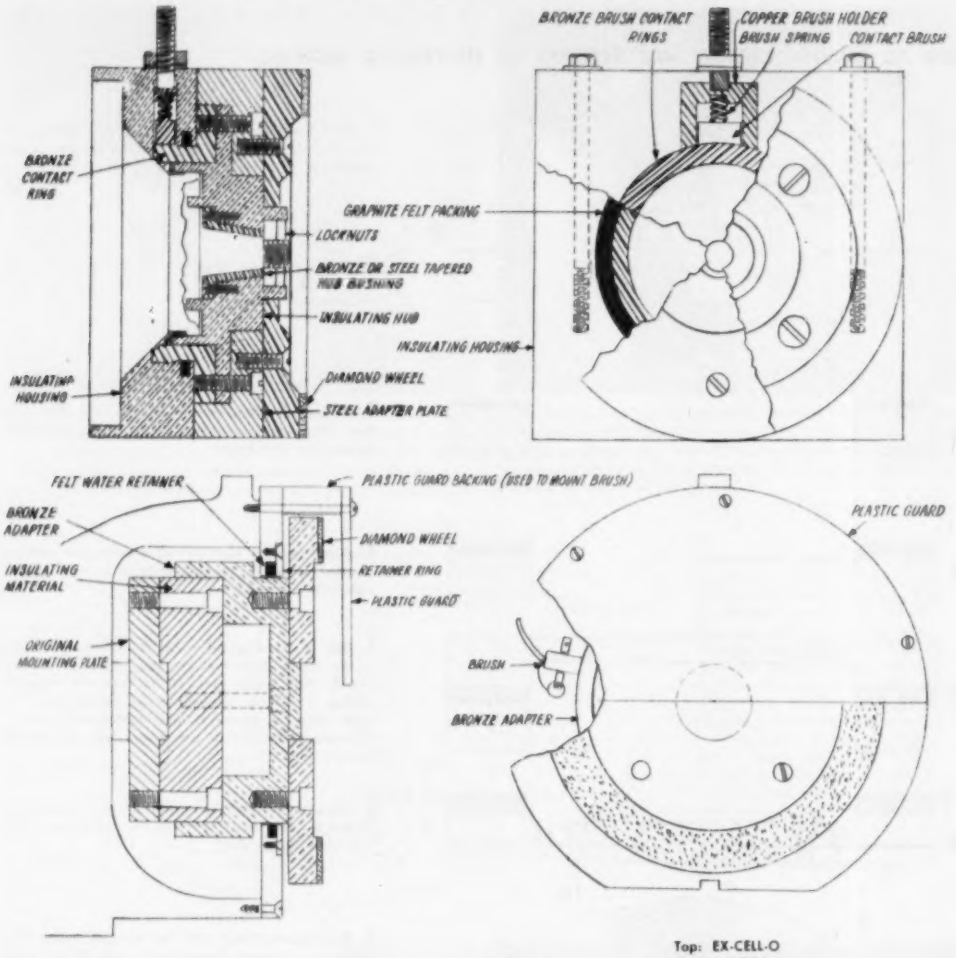
4 Nickel layer is electroplated around and over the diamond particles. Top of plate is ground parallel with bottom of ring.

5 Hub of the diamond wheel is soldered or brazed to the plated surface of the ring. The original steel ring is then broken free of the adhesive bond by striking it with a rawhide mallet. Wheel now has single layer of diamonds with cutting edges all in the same plane. Wheels are made under the George Keeleric patents

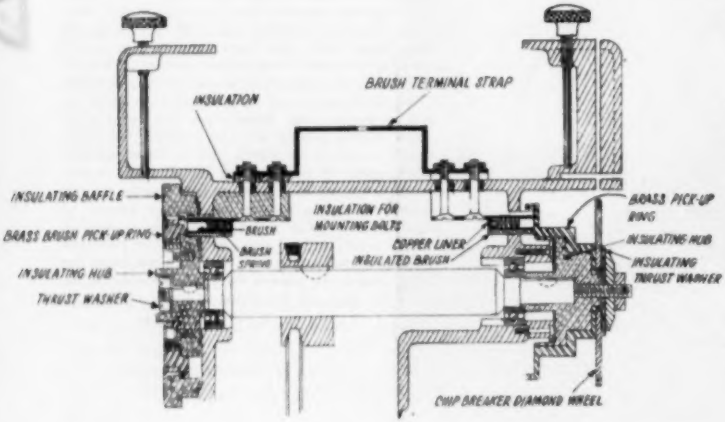
6 Wheel is deplated electrically at *A* to a depth of 0.0007 in. This depth controls the spacing of work and matrix in grinding.

7 Single-layer wheels must be mounted to run true, because if it were dressed true most of the single layer might be removed. Four conventional bolt holes *B* are provided to mount the wheel on the spindle When these bolts have been drawn down snugly, the wheel is checked with a dial indicator. If there is a low spot, threaded studs in nearest auxiliary holes *C* are tightened to pull the wheel away from the adapter in this area. Wheels can thus be trued in a few minutes without shims or dressing. This truing process is covered by patents held by Elmer Speicher. Concentration of the diamonds in this wheel is considerably greater than that currently known as 100 concentration. This prevents intermittent contact of work to matrix which would cause arcing or sparking. It also results in less snagging action of individual diamonds, producing a better finish. Particles must not be so close as to prevent the flow of electrolyte between the work and the matrix of wheel.

HOW TO CONVERT CARBIDE TOOL GRINDERS TO ELECTROLYTIC GRINDING



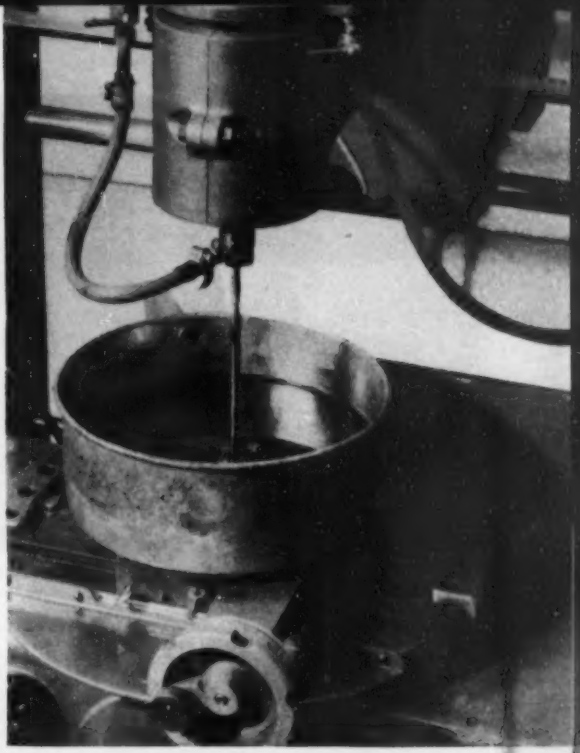
Top: EX-CELL-O
Center: DELTA
Bottom: HAMMOND



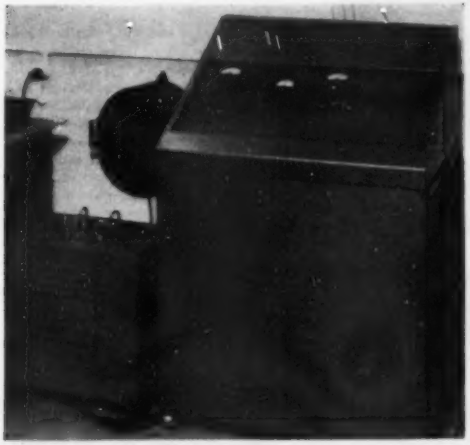
Conversion is simple. Grinding wheel must be insulated from the machine spindle. Insulation can be such materials as Lucite, Formica, or Panylite. Positive lead from the control cabinet is connected to machine table; negative lead to brush bearing on the wheel. Any arcing at the brush will have the same current-reducing effect through the control as would arcing at the work —so brush area must be shielded to keep brush dry. Shown here are details for converting Delta, Ex-Cell-O, and Hammond CB-77-B carbide tool grinders. Other grinders can be similarly converted. Various manufacturers have or will soon announce models with insulated heads for electrolytic grinding.

Britain, too, HAS ELECTRO-SPARK MACHINING

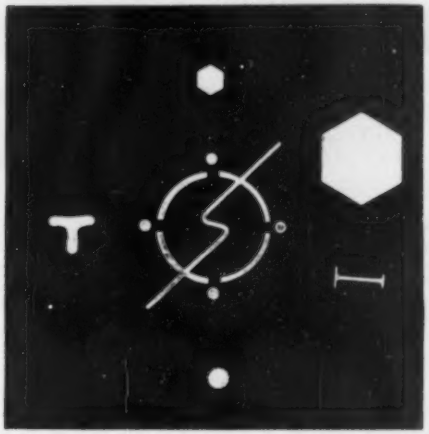
Electronic disintegration methods for machining the "unmachinable" metals are no longer new to American Metalworking. They hold much promise for the future; have been described in detail in a number of AMERICAN MACHINIST articles. Britain, too, is doing considerable work to develop better techniques. Here we provide a pictorial presentation of their progress with one method . . .



EXCISING MACHINE incorporates electronically controlled servo-mechanism to maintain a constant spark gap between electrode and work. Machine table can be moved in three directions as well as rotated about its own axis or at a required radius. Holes in tungsten carbide are cut at 1 1/8 in. per hr, using 7/32-in. dia solid graphite electrode. Dielectric fluid is kerosene. Sparking occurs more than 18,000 times per min

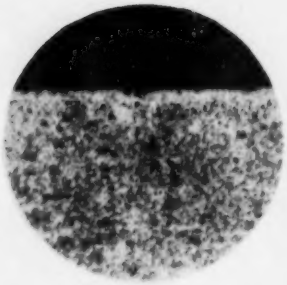


SPARK GENERATOR contains necessary control and switch-gear to adjust spark discharge voltage and capacity in discharge circuit to provide for varying conditions. For finishing, spark effect must be weaker than for roughing. Overload cutoff quenches spark before it degenerates into arc that would melt material locally and spoil workpiece

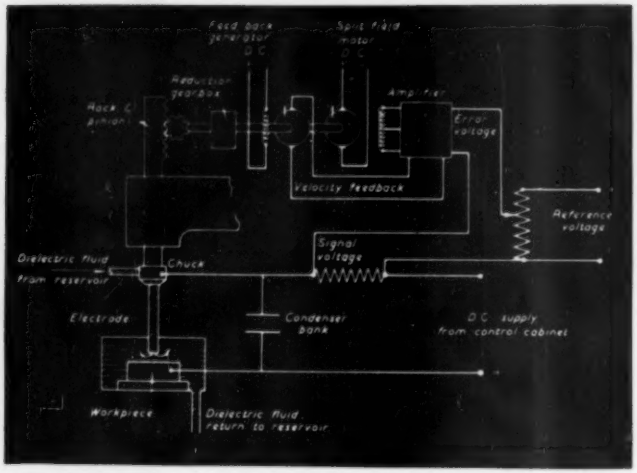


SPECIMEN FORMS pierced by electro-spark in tool steel hardened to R$_c$ 65. Shape of electrode is accurately reproduced. Larger holes are excised with a hollow copper electrode in a trepanning operation. Conventional machine tools can be modified to utilize this equipment

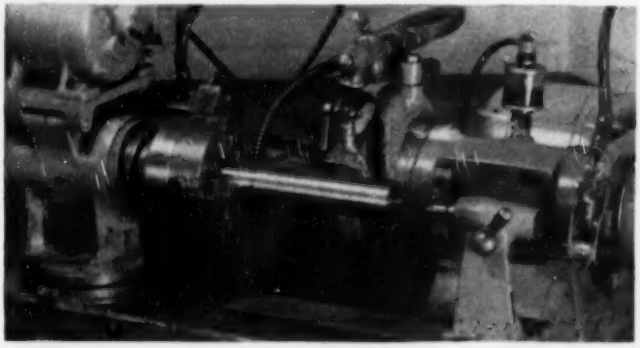
BY M G SEED, SPARCATRON LTD, GLOUCESTER, ENGLAND



SPARK DURATION is so short, in spite of high temperatures in gap, work is not heated, hence structure is not affected beyond a surface layer about 0.0001-in. thick. Although a finish of 7 mu-in. rms has been obtained, surface is matte instead of shiny. This condition is caused by cavitation action of tool, rather than rubbing action of conventional cutting tools

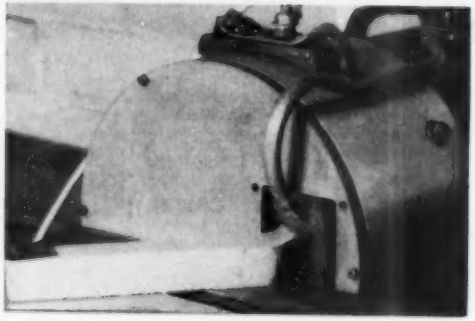


SERVO-CONTROL CIRCUIT is essential for spark drilling or excising. If electrode is not in position to maintain correct spark gap, "error signal" is generated and fed to electronic amplifier. Amplifier output energizes split-field dc motor to move electrode by means of reduction gear, pinion, and rack



ADAPTED FOR SPARK MACHINING, standard cylindrical grinder has workhead insulated from frame. Voltage is applied to wheel electrode and work through slip rings on chuck and wheel spindle. There is no contact between work and wheel during machining. Dielectric fluid is flooded over wheel and work; is circulated exactly the same as coolant. As no contact occurs between wheel and work, required driving power and bearing wear are reduced; deflection is avoided

FOUR DIFFERENT FINISHES, produced by varying intensity of spark discharge, range from roughing for fast metal removal, to fine finish. At 22 v, 15 amp current is used for roughing and 3 amp for finishing. Machines remove 0.0032 ipm on a ¾-in. dia over a 4¼-in. length, or 1.08 cu in. per hr. Smaller condensers are expected to improve 7 mu-in. rms finish now obtainable

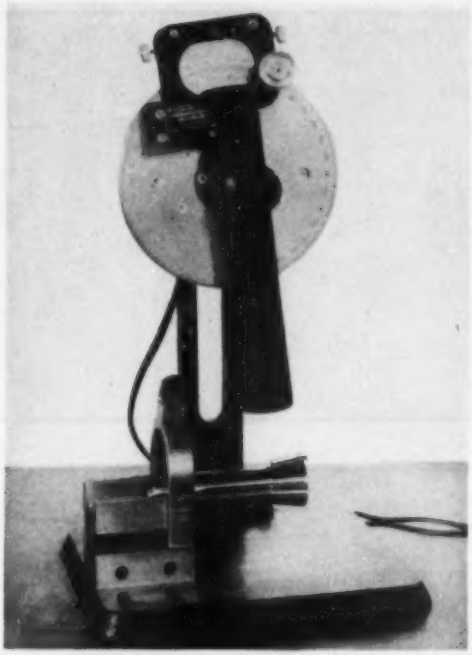


OFF-HAND GRINDING of carbide-tipped lathe tools can be done by spark method, but requires some skill in maintaining the correct gap. Tools ground thus require no lapping. Technique eliminates need for diamond wheels. As surface pattern is non-directional, micro-cracks are avoided and oil or coolant retention is improved

THE COLLIMATOR AND HOW TO USE IT

The Goniometer-Collimator is an optical tool that measures angles to great precision and yet is simple enough for shop operations. Collet and lathe-tool angles are easily checked and bedway flatness can be measured to 0.00007 in.

BY R FAWN MITCHELL, Chief, Optical Div.
SAFE FLIGHT INSTRUMENT CORP.
WHITE PLAINS, N Y



GONIOMETER-COLLIMATOR, shown checking a collet taper, provides a fast, accurate means of measuring and setting angles. A gage block, used as the reflector, is first set on the collet shaft. Using this as the reference surface the collimator is set at zero. Then the angle of the taper is read with the reflector placed on the angle as shown

Optical aids, from simple magnifiers to powerful optical instruments, are coming into wide use because of demands for greater and greater accuracy. Because light rays have no weight or inertia they do not bend or vary and thus can be controlled with ease and precision.

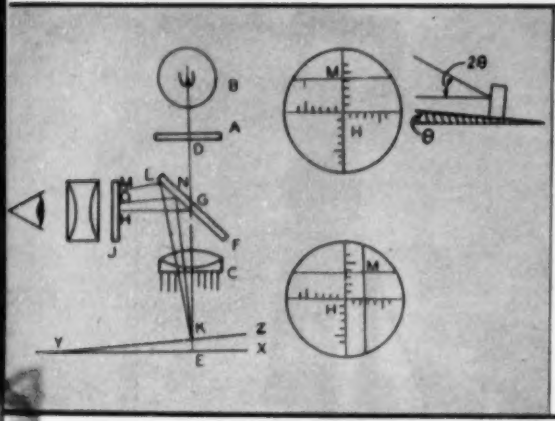
One of the most useful optical instruments is the collimator, which enables the user to set its optical axis at right angles to a reflecting surface speedily and with extreme accuracy. When the reflecting surface is at some other angle than 90° to the beam of light coming from the collimator, this error is measured with a reticle. The instrument reads to twice its basic accuracy because the *angle of reflection* of the beam of light is *twice the angle of error.*

A device known as the Goniometer-Collimator, made by Safe Flight Instrument, is an easy-to-use yet accurate version of the collimator. It is rotatable about a horizontal axis. A circular scale calibrated in quarter-degrees and a vernier permit readings to ¼ minute of arc—at a distance of 1 in., this represents a vertical displacement of 0.00007 in. A quick-release spring-loaded drive enables it to be quickly set to the work.

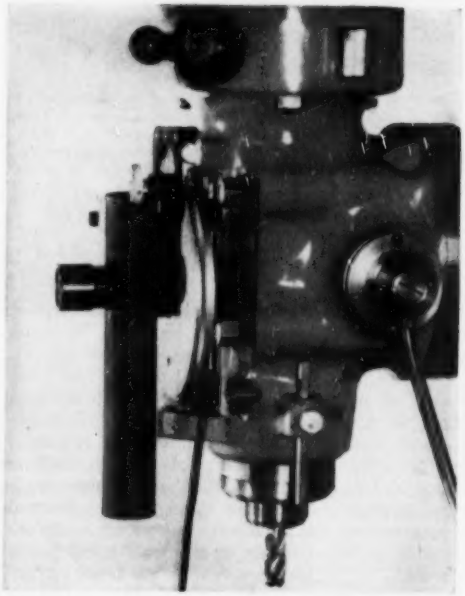
Light leaves the instrument as parallel rays so there is no focusing involved. It is as easy to check a surface 1 in. away as one several ft distant, although the greater the distance the greater the necessity for preliminary setting accuracy to get the image within the instrument field. This non-focusing feature is particularly useful in checking deep-bored seats, cylinders, and similar work. By using a right-angle-prism it is possible to see into and check blind holes and to align parallel blind holes.

One application of the collimator is in the manufacture, assembly, and testing of vertical milling machines. For example, the spindle is checked to see that the internal taper has the correct angle. An accurately ground cylindrical rod is clamped against the inner surface to establish line contact against the taper. Then the angle between the inner rod surface and outer spindle surface is measured. Other uses on millers include checking bed ways for flatness, determining that the cross-bar flange face is at right angles to the cross-bar, and that the spindle is square with the table.

(See next page)

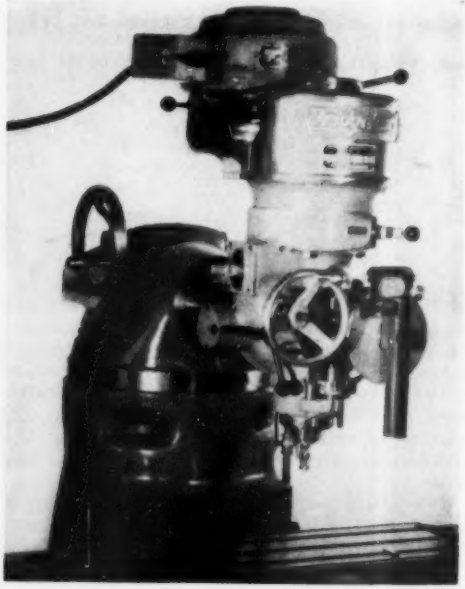


THE OPTICAL PRINCIPLE: A cross-line target reticle *A* is illuminated by a lamp *B* and is set at the focus of a lens *C* so that all rays from the lens emerge parallel (collimated). A central axial ray passes through the center *D* of the cross-line target and strikes work surface *XY* at *E*. The reflected ray strikes the semi-transparent mirror *F* at *G* and is reflected again to a position *H* at the center of the cross-lines of the measuring reticle *J*. It is then in exact super-imposition on the measuring lines. But if the work surface is at *YZ*, at some angle other than perpendicular to *DE*, the ray *DK* will be reflected to *L* on the mirror and then to *M* on reticle *J*. By geometry, the angle *DKN* equals the angle of error *XYZ* and the angle of reflection *DKL* is twice this angular error. This effect also, of course, doubles the inherent accuracy of the instrument. Drawing at upper right shows how a small angular error in the vertical azimuth would appear in the eyepiece and how the reflecting surface would be tilted to produce it. Appearance of a small error in two azimuths is shown at the lower right

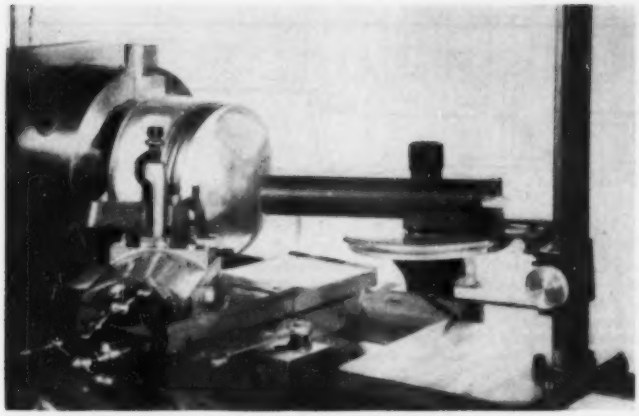


THE COLLIMATOR IS ATTACHED to a Bridgeport miller by hooking on a simple slotted bracket to the two right-hand bolts holding the head on the crossbar

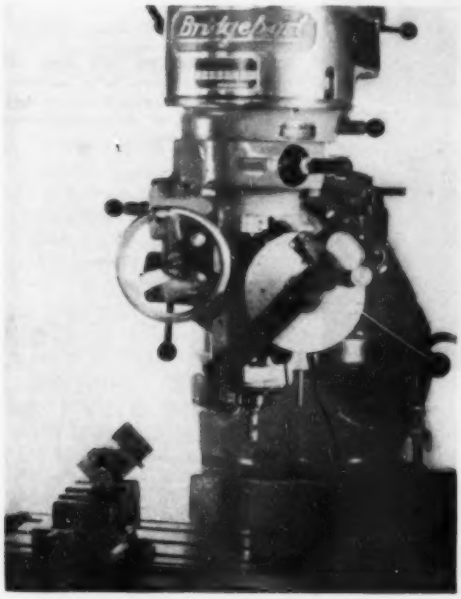
USE ON THE VERTICAL MILLER



FOR PRECISE VERTICAL MILLING WORK, the first requirement is that the head be set exactly vertical to the table, especially essential for boring. The collimator is set by means of the cross-line image reflected by a gage block set on the table. At this position it is a simple matter to check the flatness or parallelism of the table travel, up or down, to or fro, or side to side. We still do not know whether the spindle is vertical to the table—the easiest and best check is to mill a spot on a piece without moving the table, then determine if the spot is parallel to the table. Another method is to collimate against the table and then against the spindle to see they are at 90°



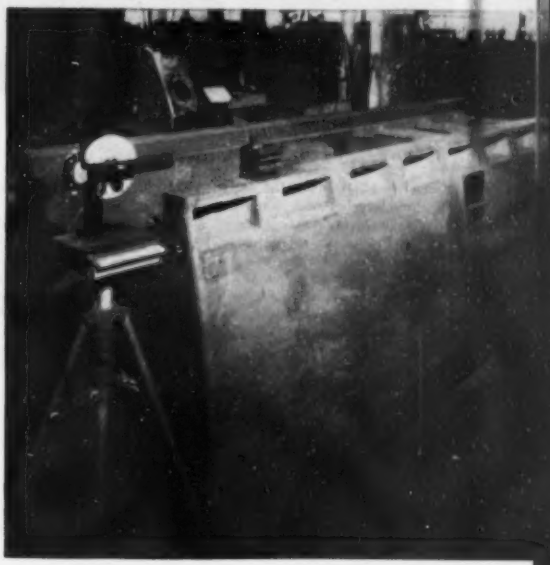
SETTING A LATHE TOOL — An L-shaped bracket is attached to the stand in order to set the collimator axis horizontal. Two or three readings are taken with a reflector set at different parts of the face plate to align the axis of the collimator parallel to the axis of lathe rotation. Also, it is a good idea to clamp the collimator base to prevent it being moved accidentally. Then a gage block (reflector) is clamped against the cutting edge of the tool. For this it is necessary to make two small wedges so the clamp will hold. One wedge should be slightly more than the tool angle and one slightly more than the tool-rake clearance. With the collimator set to the correct tool angle, the tool is adjusted until the reflector is set normal to the collimator. The tool is then at the proper angle. The other cutting edge of the tool can then be checked if desired by the same process

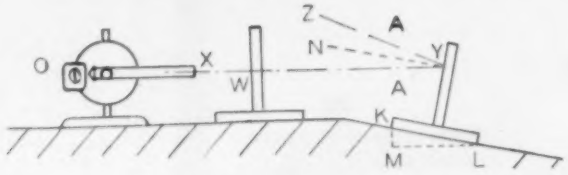


TO GET THE CORRECT MILLING ANGLE after setting the head vertical to the table, the head is rotated and the angle checked against the work or table. Mounting the collimator on a miller in this manner has a special advantage for experimental work, and tools and gages where it is desirable to set and check the work on the machine

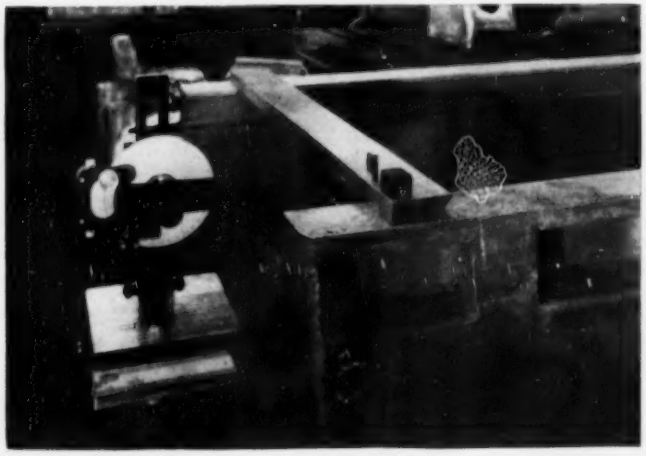
CHECKING BED FLATNESS, ALIGNMENT

BED used by Bridgeport Machines, Inc., Bridgeport, Conn, to machine the ways on its vertical millers was checked for flatness and alignment to extremely close limits, limits beyond those normally possible when using levels, straight edges, and rod lead. The collimator was set up on a stand so that it sighted along one arm of the V-shaped 11-ft-long bed. A gage block was set on a regular V-block and this combination was moved by steps along the whole length to check for flatness

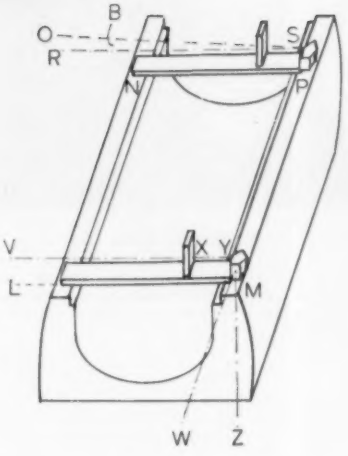




IN CHECKING FOR FLATNESS, the optical axis was set horizontal so as to be reasonably parallel (not necessary to be exact) to the bed surface. Then the gage block was set so that it reflected light back into the instrument when the V-block and bed edges were aligned. The collimator is then set so that the cross-lines coincide with the target lines. If the bed starts to slope slightly as the V-block is moved along, the reflected cross-lines will be displaced vertically above the target lines. The collimator can detect errors in alignment of about 5 to 10 sec. of arc. With a V-block length *KL* of 1 in. the vertical error *KM* would only have to be 0.000025 to 0.00005 in. to be detected



TO CHECK THAT THE TWO ARMS ARE PARALLEL, the collimator is set horizontally as before and a gage block and right-angle prism are set on a straight edge across the two ways



THE BEAM FROM THE COLLIMATOR passes through the right-angle prism and strikes the gage block at *X*. The beam is reflected back along the path *XY* parallel to the base line *LM* and into the collimator so the cross-lines are aligned and centered. Only one other reading at the far end is necessary if the bed arms are parallel. When, for example, the far end has one arm 0.010 in. higher than the other, the line of sight parallel to the straight edge will be along line *OS* while *RP* is the real parallel to *LM* and *XY*. As before, the collimator will double the angular error *OSR*. With the length of the straight edge about 3 ft, a vertical error of 0.014 in. will be about 4 secs of arc

ROUND TABLE

Color Blind

"When you went soft-headed and got 'em to paint your machines up in colors, Ed, I figured it was just advancing age. But what are you doing now, starting a campaign to make the rest of us soft-headed, too?"

"That's a nice, friendly way to begin an argument, Al! I told you when I started that I was going to do a little experimenting, and you poohpoohed it when it was done—you as much as said it looked like a ladies dressing room. I haven't said a word since, so what's your beef?"

"Maybe you haven't said a word—*to me*. But the boys didn't think up the idea of getting my department painted, and all the arguments in favor of it. You must have had a hand in it."

"Nope, Al, I didn't. I'll bet your boys have been talking to mine. At least, I've seen several of 'em come looking around, sort of sizing things up. After all, if a little colored paint makes toolmakers feel better and work better, it certainly should do more good in a production department like yours. And it's safer, too."

"I've heard all that, Ed, and I don't believe it. What we need is better lights first, and more space second. No paint will help much to hide clutter or brighten up dark corners."

"That's where you're wrong, Al. Paint can do a lot of things towards brightening up dark corners. It can also make it easier to see work and controls. Yellow or orange makes controls stand out, everybody knows red means danger, and light blue or ivory suggests keeping it clean."

"Yeah, and you can't see aluminum or stainless against ivory or light blue as well as against gray —so you cut down safety in those cases. What's more, if contrast worries you, you'll have to paint up all the bearing surfaces and machine tables. They shine, you know, Ed."

"Just because you can't fix the whole business, Al, is no reason you shouldn't fix what you can. There isn't much you can do about the machined surfaces, I admit, but there's a lot of surface in each man's area of seeing that can be cheerful, clean, and bright rather than dark and all one color."

"Maybe I'm color-blind, Ed, but I like the plain gray. It goes with blue overalls and gray steel and cast iron."

"That's just the point! A little bright color would relieve the monotony and pep things up. Besides, it helps handling, helps learning, cuts rejects, and cuts eye strain and fatigue."

"How's it for stomach ache and virus? Seems to help everything else. Ought to help the housekeeping instinct, too."

"It does, Al, it does! Maybe it's just that we toolmakers have more pride."

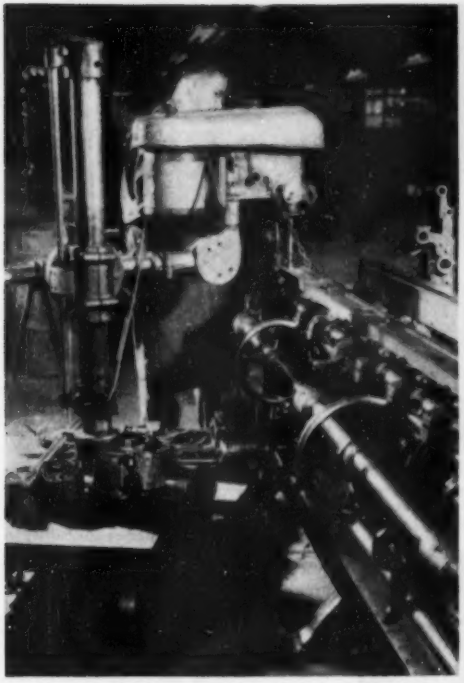
"Now see here, Ed . . ."

***DOES** color painting encourage productivity and raise morale? Is it as important as orderly arrangement and proper lighting in raising efficiency and safety? Your ideas and opinions on this subject will help others. Discussions of earlier topics appear on later pages.*

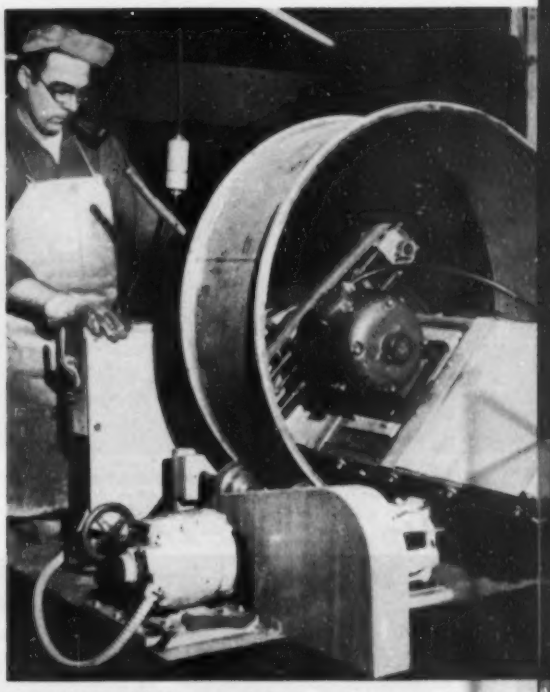
DIALS ROTATE CONTINUOUSLY on this two-way fixture that checks wall thickness and height of rotating bands for artillery projectiles. Copper bands are rotated against ball-bearing posts with indicators mounted on baseplate. Inspection is more complete and faster than with micrometers. *Chase Brass & Copper*

SHOP SHOTS

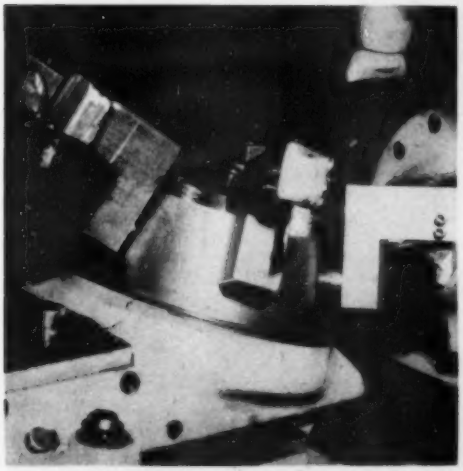
FOUR STEPS ARE ONE on 600-ton Warco press, where transition liner shells for jet engines are trimmed, offset, and pierced. Four operators handle the Inconel parts continuously, shifting them from one die to the next. Parts before (left) and after (right) are shown in front of press. *Ryan Aeronautical*



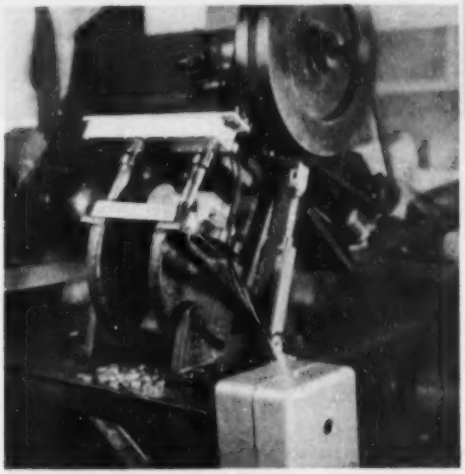
MOBILE RADIAL DRILL works on knitting machines at Karl Lieberknecht, Inc. Equipment is a Delta head mounted on a right-angle bracket that can be adjusted vertically and horizontally from the post on the heavy dolly. Difficulty of drilling the long knitting machine justified the cost of the special drill unit. *Rockwell Mfg Co*



ROTATING BELT SANDER in automatic fixture smooths out spotwelds inside jet-engine cases. Work rotates while belt-driving fixture moves laterally. Production is up 400% over hand grinding. *Solar Aircraft*



NEW BOX-TOOL HOLDERS on Hardinge lathe provide flexibility and accuracy on small machine. Regular box tools had no fine adjustment, so special set was made with hex-head screws backing up toolbits. Production used to be one piercing punch in 15 min; now is one each 45 sec. *Temco Aircraft*

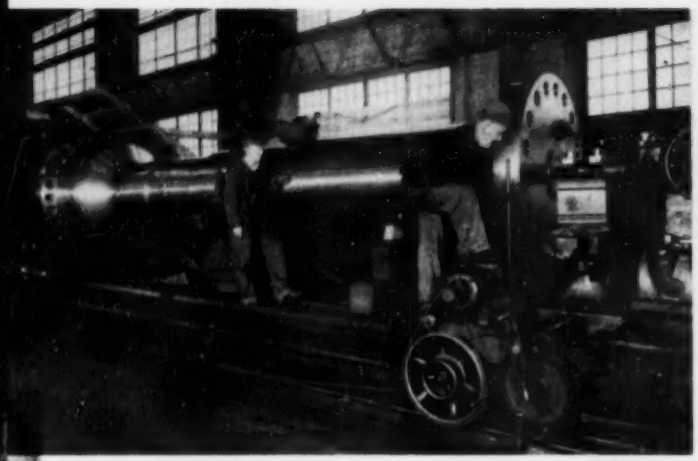


"ATOMIC" PRESS-SAFETY UNIT is the latest. Wristbands on operator are coated with radium salts, like watch face. Geiger tube is set at boundary of danger area. When wristbands are closer than 18 in. to tube, press cannot trip. Advantage is no mechanical linkage or chains. *Modern Air Corp*

GIANT SIZE, PLUS ACCURACY MAKES TURBINE BUILDING TOUGH

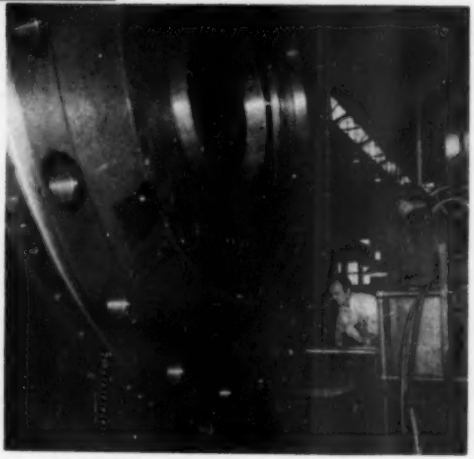
In spite of the weight and bulk of components, large hydraulic turbines with capacities over 100,000 hp must be built precisely. To accomplish this, ingenious shop setups are required — many of those shown here being applicable in smaller shops. These were photographed at Baldwin-Lima-Hamilton Corp, Philadelphia, Pa., where turbines were produced for such installations as Wheeler Dam of the Tennessee Valley Authority, Ross Dam in Washington, Hoover Dam, Colorado and others.

By GEORGE H DE GROAT
ASSOCIATE EDITOR



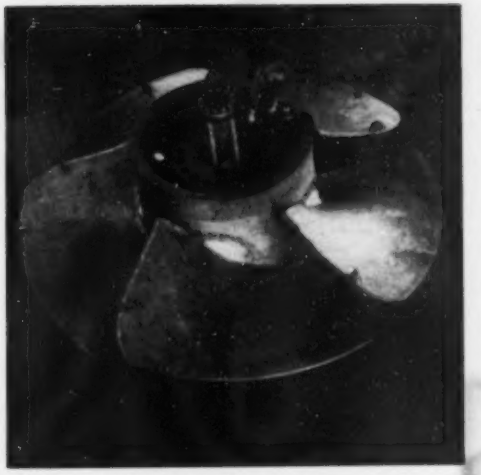
HEAVY TURBINE SHAFTS, turned in this 5-foot lathe, are checked for concentricity of outside diameters with bore. Concentricity within 0.002 in. total indicator reading is required for operation of inner shaft that controls pitch of propeller to maintain constant power output. An older lathe here has an ingenious belt drive for rapid carriage traverse

MACHINING JOINT FACES of one section of a 2-part cast stay-ring is accomplished in this 14-ft planer. Great height of upper faces creates a problem that could not practically be solved with smaller equipment. All faces are planed to exacting tolerances to insure perfect fit of two halves



GIANT HORIZONTAL BORING MILL produces accurately spaced holes in which guide vanes pivot on this 15½-ft-dia turbine upper head cover. Indicating disks, bolted through cast holes, determine chordal distances with indicator gage setup. First, uniform distance from OD of disks to OD of cover is established, after which distance between disk edges is measured. Spindle is then indicated for alignment with hole axes and boring operation is carried out

SR-4 STRAIN GAGES test stresses in spiral casing under hydrostatic pressure. Water at 450 psi is pumped into sealed-off casing and pressure held for 2 hr. Test exceeds operating conditions by approximately 100%



FREEDOM OF BLADE MOVEMENT in hub and vanes of adjustable-blade propeller runner is checked by pumping oil into a double-acting test cylinder. Cylinder piston is connected to 5-arm crosshead in assembly that actuates blades for simultaneous operation

Tips FOR TOP SHOP MEN

445 Sailors used to size up a prospective captain by "the cut of his jib." Your new men do the same thing. Be sure the tilt of your jaw betokens confidence but not truculence and your manner has a smile, not a sneer.

446 If you're installing a radically new process saving much labor time, it may be advisable to keep the process separated from the present operation. Some labor is nearsighted on methods improvement.

447 Have some independent thinker examine your tolerances regularly. Engineers delight in close ones and the cost frequently increases as the cube of the tolerance reduction. If and where you don't need 'em, close tolerances cost too much.

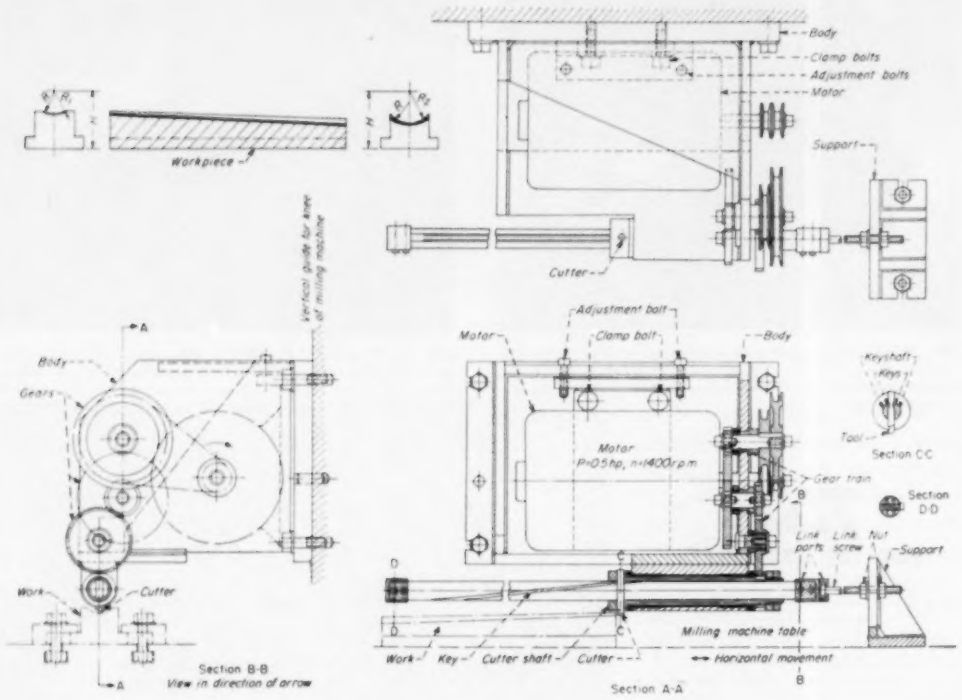
448 Keep an eye out for the man who's "out of sorts." He may have something troubling him—home, family, finances. That's his business. But keeping him from hurting himself and others while his mind wanders is your business.

449 It is not major differences of opinion that cause rifts in an organization, but many little ones, repeated. Watch for the "little things that start big wars."

450 Tolerances depend on tooling, training and technique. If tools are properly designed and kept, you can train most men to hold reasonable tolerances.

"He read about 'Comparison of Methods for Surface-Finish Control'."

Practical Ideas



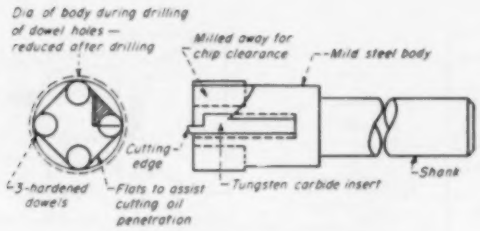
Progressive Radius Milled by Key-Shaft Guided Cutter

To mass-produce a progressive radius on workpieces which cannot be set up in a lathe is a complicated task. One method is plunge-milling with a form cutter, but this calls for a special cutter; often too expensive for a small job.

We built a device to do this job which comprises a main body, consisting of welded steel plates, that is bolted to the vertical guide for the milling-machine knee. An electric motor is hung from the vertical plate of this body; this is easily adjusted to regulate belt tension.

From this motor, a V-belt transmits power to a gear which drives the cutter shaft in a total ratio of 12.5 to 1 or 7.2 to 1. Through the cutter-shaft passes a composite key-shaft which is made in two halves. The latter is provided with keys which engage the keyways in the cutter. This key-shaft rotates with the main shaft, but is able to move in the horizontal direction as well. To move thus, the key-shaft is fastened, by the link-screw, to the support which is bolted to the milling-machine table. These link parts are bronze to provide a better slide fit for the link-screws.

In operation, the workpiece is premanufactured as shown. The first cut (dotted lines) is made by a cutter whose diameter is approximately 2 R. Hence the radii on both sides are equal. Then, the workpiece is fastened, or fixtured, to the milling table. As the cutter rotates and the table is fed longitudinally, the workpiece passes beneath the cutter. Simultaneously, the key-shaft is pulled through the cutter-shaft. The key on the inner shaft progressively pushes the cutter out and, as feed progresses, the radius of cut is increased. Nuts on the link-screw permit exact setting of the cutter's radius when starting. However, a special key-shaft and cutter are needed for each job. Size limits are determined by the key-shaft diameter. *Eugene Winkler, Konolfingen, BE, Switzerland.*


Dia. of body during drilling of dowel holes — reduced after drilling
Milled away for chip clearance
Mild steel body
Cutting-edge
3-hardened dowels
Flats to assist cutting oil penetration
Tungsten carbide insert
Shank

Carbide Boring Tool for Deep Holes

Boring long holes true and with a good finish was difficult as we lacked good reamers. The problem was solved by turning a mild-steel bar to the proper length and then accurately drilling four evenly spaced holes just inside the periphery at one end. The outside measurement across two holes was equal to the required bore. Then, four round CRS bars were inserted into the holes to protect them against damage while we turned the bar diameter smaller than the bore size and four flats were milled around the bar. Thus, when the protective bars were removed, the four holes were open along their length. Three hardened and ground dowels were then pressed into three of the holes. A tungsten-carbide rod was ground to half of its diameter for a short distance and pressed into the fourth hole, which was previously partially milled clear for chip escape.

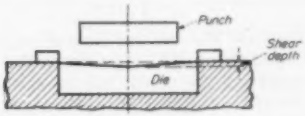
We mounted this tool in a horizontal boring mill, drilled a hole through the casting to be bored, bored a starting hole to size for about one inch, and then bored the hole using the boring tool. It removed about ⅛ in. of metal from the hole sides and produced a remarkable finish. When the dowels wear, we press them out and turn them slightly to bring them back to size. To sharpen the carbide tool, it is pressed out, turned slightly, and reground on the top and front faces. For heavy cutting, the tip is brazed into position. *Allan Clarke, Rochdale, England.*

Don't Neglect Feed Volume for Air-Operated Devices

When we installed additional machinery in our shop, we found that the air pistons on the new equipment together with the pistons on the orginal equipment would not operate simultaneously at full efficiency. In an attempt to improve this condition we installed one additional compressor in the original battery. To our dismay, the pressure built up faster and the compressor operated less frequently, but the air-operated tools showed no better efficiency.

Then we examined the main airline and found that it was considerably larger than the branch feeder lines, each of which supplied air to a number of machines. Also, the smaller air devices worked better than the larger equipment. *The feeder lines were too small to supply the volume of air required to operate all of the pistons efficiently.*

Small steel accumulators (air tanks) were placed in the feeder lines close to the control valve of each of the largest pistons. These tanks hold a larger volume of air than the air device consumes in one stroke and refill during the exhaust stroke, hence they eliminated the problem and avoided a costly changeover to larger feeder lines. *Fred Lettino, Astoria, N Y*



Shear for Press Tools

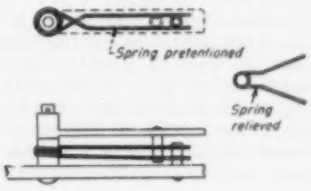
Shear load for press tools blanking heavy gage sheet can be greatly relieved by putting shear on the *die*. It is not unusual to put shear on the punch, but shear on the die has less tendency to deflect the punch. If the shear depth is equal to one-half of the thickness of the plate being blanked, this will approximately halve the load on the punch and also on the press. In addition to reducing the load, punch and die life are prolonged. *R G Vare, Christchurch, Hants, England.*

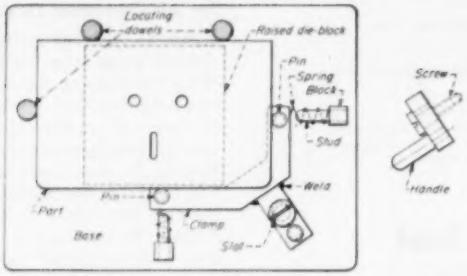
Centering Device Uses Torsion Spring

Designers seeking a centering method for machine or tool members such as arms or handles sometimes overlook a simple and efficient device.

A torsional spring is placed on the pivoting stud of the arm. The free ends of the spring are bent so that they cross. Two dowels are placed, one in the stationary portion of the machine and the other in the movable member, or arm. As shown, both dowels are positioned between the crossed ends of the spring.

When the arm is turned to one side, the dowel on it will carry along with it one end of the spring while the other end of the spring will bear against the stationary dowel. If the arm is turned in the opposite direction, the spring ends will reverse position. The spring tension created by moving the arm either way will force the arm back to the center, or neutral, position. *Haim Murro, Boston, Mass.*

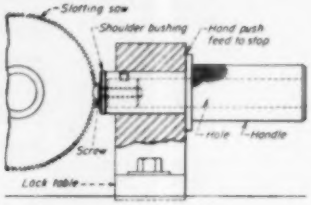




Equalizing Clamp For Presswork

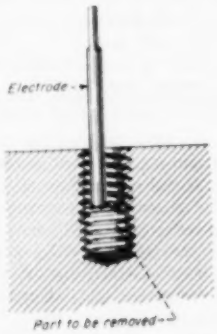
A readily actuated equalizing clamp for punching and piercing sheet stock is made as shown. To load the part, the operator pulls the handle backward, places the part on the die block, and releases the handle which presses forward. The clamp is also suitable for drilling, especially sensitive drilling, and similar operations.

The handle is a steel bar pressed into an extension which is welded to the angular bracket that does the actual clamping. Locating and clamping are accomplished by springs which are mounted on fixed studs. These studs are pressed into stationary members which are welded to the base. Pins pressed into the bracket force the part against the locating dowels. This design is especially practical when relatively small parts require piercing. *F C Elmo, Dayton, Ohio*



Milling Screw Slots

In a recent issue (*AM*—Sept 1 '52, p 143) you described a V-block tool for slotting screws with a bandsaw. We had to devise a way to prevent threads from being crushed when we held them while we *milled* slots in screw heads. By making the tool-steel fixture shown and using a slitting saw on the miller, we greatly outproduced the conventional vise-jaw — 10-screw-pocket method. Threads were not crushed and slot depth was uniform. Bushings can be made to take a variety of thread diameters. A shoulder bushing is made for small screws to 0.380 in. diameter. Its OD is equal to the handle ID + 0.0005 in., – 0.000 in. With a handful of screws to be slotted in one hand and the holder held in the other hand, work can be rapidly loaded and fed into the cutter at a fast rate. *Dick Branberg, La Verne, Calif.*

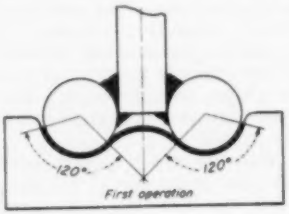


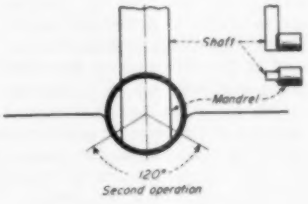
Electrode Removes Broken Parts From Deep Holes

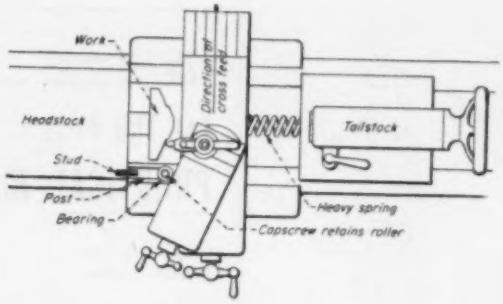
To remove broken pins, screws, or taps which are not held too tightly, especially hardened parts that cannot be drilled, place an arc-welding electrode against the part with the power on. After a moment break the circuit and allow the tack weld to cool. Then pull or turn out the broken piece. A few drops of penetrating oil placed in the hole just before removal may simplify the job. *A Vetsch, Steffisburg-Station, Switzerland.*

Only Two Operations to Form Ring

I read the article "Three Dies Form 1-in Rings" by T H Hsu (*AM*—Aug 4 '52, p 133). Actually, it is possible to form this part in only two operations. Change the tool used for the first operation as shown so that the bent area at each end is about 120°. For the second operation the punch has its shaft welded to the back of the mandrel; thus allows the ring to close. By bending the first form slightly beyond 120°, the ring is closed. *A Vetsch, Steffisburg-Station, Switzerland.*





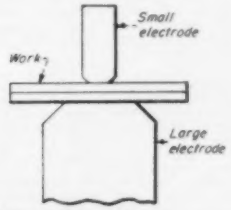


Simple Modification Speeds Angular Facing

100 bronze castings required facing at an angle to the sides. These castings were 6 in. in dia by 1 in. thick and were held in the lathe chuck by a small boss on the back. With no power feed on the compound rest, this operation proved very tiring as at least two cuts were required on each casting and the compound had to be hand-cranked. When I learned that we were to receive many more of these castings, and each at a different angle, I devised this setup.

A ½-in.-dia hole was drilled and tapped in the headstock and a stud was screwed into this hole to support a ½-in.-dia. CRS post which was screwed tightly to the headstock. The opposite end of the post was machined to take a ball bearing of slightly larger diameter than the post. Location of the post was arranged to just clear the periphery of the turning casting and to bring the roller in contact with the machined side of the compound rest. Then, the tailstock was clamped with a coil-spring placed between it and the carriage. This spring provided sufficient compression strength to maintain positive contact between the roller and the compound rest. With the compound rest set at the required angle and the toolpost and toolholder set for the desired cut, the regular cross-slide feed was engaged. However, instead of carrying the tool straight across the work face as normally, the carriage is forced toward, or away from, the headstock according to the angle setting of the compound. Thus, the same angle is reproduced on the work face.

This setup works well for angles up to 45°. However, the greater the angle, the greater the side thrust on the post and it should be strengthened accordingly. In lathes not equipped with machine-finished sides, a strip of CRS flat stock is fastened on the side to provide a flat surface. *William Gardiner, Toronto, Canada.*

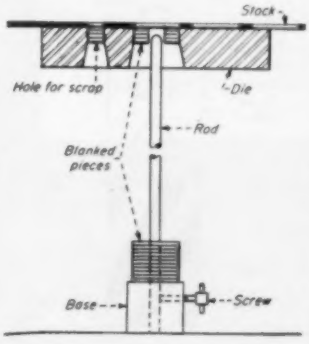


Welding Thin Plates

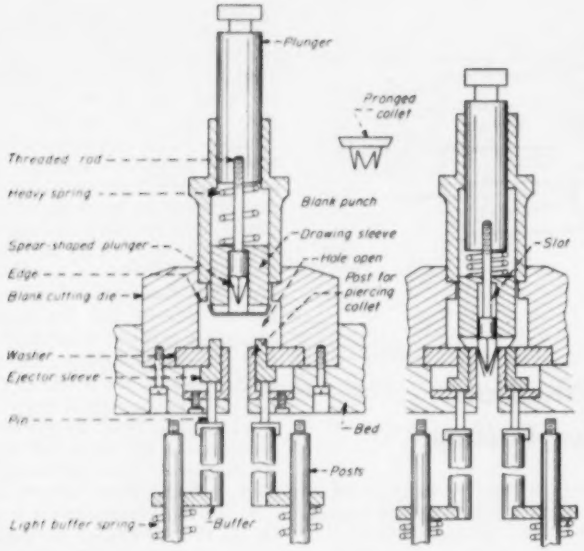
When welding thin plates, a better-than-usual finish is produced by using a large and a small electrode. Increased current will be required to produce a weld diameter equivalent to that produced by electrodes of similar diameter. Use of dissimilar electrodes will minimize pitting and identations to provide a smoother finish on the work. *R G Vare, Christchurch Hants, England*

Rod Collects Punched Blanks

Blanked sheet-metal pieces, that have one or more holes in them, stamped in a progressive die, can be conveniently collected from the die by stacking on a rod. To do this, a rod having a diameter slightly smaller than the punched hole is held by a screw in a heavy base of steel or cast iron. Rod length should be about equal to the height of the punch-press table above the floor.



In operation, the rod is placed underneath the press and its end is inserted into the hole formed by the blanks held by the die at the last blanking station. The correct rod height is set and locked with the screw. As blanks are released from the die they will slide down the rod and form a neat stack. When the rod is filled it can be removed, intact with the base, for storage; and another rod and base inserted to replace it. *Haim Murro, Boston, Mass.*



Double-Action Die Forms, Pierces, Pronged Collets

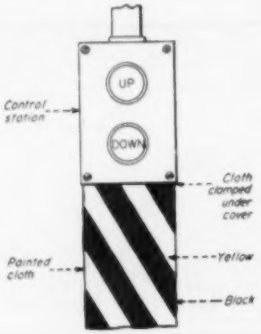
In one operation, this die will form and pierce pronged collets at the rate of 400 gross in eight hours. As the upper punch cuts the blank in the usual way against the lower die, the plunger draws the collet to shape. The plunger continues to descend to the lower ejector sleeve and the stationary tube post, where the spear-shaped punch pierces the collet to form four prongs.

On the up-stroke of the plunger, the lower ejector sleeve, controlled by the lightly spring-loaded buffer, follows the collet until it is stripped by the edge of the lower blanking and drawing die. Then, the collet is ejected by air blast or, in an inclinable press, through the opening in the lower die. Thus, metal can be continuously fed. *B Menkin, Port Chester, N Y*

Safety Signal for Hoist Control

Once you have bumped your head on the cable-hung remote switch for a traveling crane, you will better know the value of this idea.

Attach a small cloth pennant, having diagonal yellow and black stripes painted on both sides, to the bottom of the pendant hoist-control station. Thus, the device becomes more noticeable against both light and dark backgrounds; is less likely to cause damage. *Thomas Trail, Catonsville, Md.*



$25 *In addition to regular payment*

for the best PRACTICAL IDEA

Winner No. 161 in Sept 1 Issue is:

R J Dodson

Chicago, Ill.

Cutter Slices Brass to Width

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

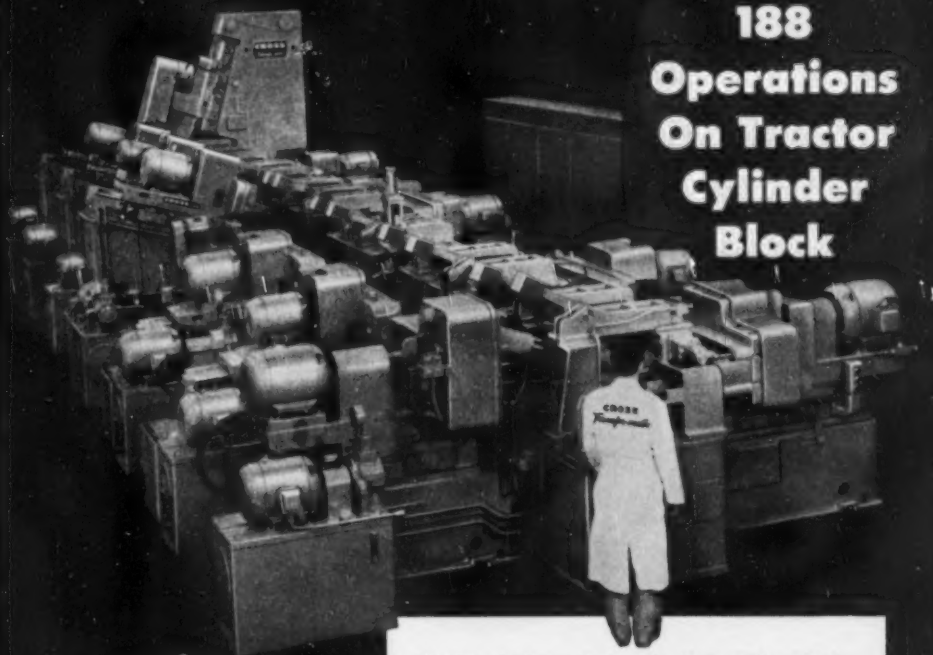
REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 36, N. Y.

Another Transfer-matic by Cross

188 Operations On Tractor Cylinder Block



* Mills distributor boss; drills, bores and spotfaces distributor hole; drills, chamfers and reams tappet holes; drills crankshaft and miscellaneous oil holes; drills and reams oil filler and dipstick holes; drills, chamfers and taps cylinder head, distributor mounting, oil pan and bearing cap holes; taps oil holes.
* 72 pieces at 100% efficiency.
* 22 stations—one for loading, 15 for machining, six idle.
* Cross Machine Control Unit automatically stops machine when tools need changing and pre-set tools reduce down-time.
* Gravity operated cam clamping.
* Other features: Hydraulic and electrical equipment to J.I.C. standards with stranded wire; hydraulic feed; automatic lubrication.

Established 1898

THE CO.
DETROIT 7, MICHIGAN
Special MACHINE TOOLS

MADE TO STARRETT STANDARDS OF ACCURACY AND PERFORMANCE

STARRETT DIAL GAGES

Made in a complete range of standard A.G.D. sizes and 54 types, with English or Metric graduations.

STARRETT DIAL COMPARATOR No. 653

With fine vertical adjustment. Base platen 9" x 9⅛". Vertical capacity 9¼". Throat depth 5". Indicator graduated .001".

Starrett DIAL INDICATORS

STARRETT PORTABLE DIAL HAND GAGES No. 1015-A and 1015-B

½" and 1" thickness capacities; 2½" throat. Ideal for quickly measuring plywood, rubber, textiles, paper, metal parts, leather, veneer, fabrics, etc.

STARRETT UNIVERAL DIAL BENCH GAGE No. 652

With sliding table and fine adjustment. Capacity 1¾", throat depth 1⅛". Indicator graduated .0005".

WRITE FOR YOUR COPIES

DIAL INDICATOR CATALOG describes and illustrates the complete line with specifications and useful data . . . Address Department C.

TRANSFER and DIMENSION CHARTS. Full scale details for quick tracing plus complete dimensions of all indicators and contact points.

STARRETT TOOLS

TRADE MARK Starrett REG. U.S. PAT. OFF.

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY
Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
Quality products

Pipe Threads...I

BY ELMER ZOOK, Chief Engineer
DETROIT TAP & TOOL CO

Abstracted from the "Pipe Thread Manual" (Manual C-52) published by the Detroit Tap & Tool Co, 8615 E Eight Mile Rd., Base Line, Mich.

Of the three systems of pipe threads discussed in the following material, American Standard Pipe Threads have been in use for many years and are generally processed without difficulty with well-established practices. American Standard Dryseal Pipe Threads and Aeronautical Pipe Threads have been introduced comparatively recently and the tooling for and manufacture of these threads often give rise to considerable confusion. This difficulty may be overcome by considering both the Dryseal and Aeronautical specifications as modifications of American Standard Pipe Threads. The following data shows that the three systems are basically the same and then elaborates on their differences rather than providing three separate pipe thread specifications. Also, the data has been restricted to that which is most commonly used in order to provide a better basic understanding of these specifications.

AMERICAN STANDARD pipe thread specifications cover *tapered* external and internal threads and several classes of *straight* external and internal threads. The taper-threaded joints and those with straight internal threads and tapered external threads will generally produce a pressure-tight joint only when a sealing compound is used in the assembly. Several types of American Standard straight pipe threads are also used for assembling pipe when fluid pressure is not a factor.

American Standard Dryseal specifications cover tapered external and internal threads and straight internal threads which assemble to produce pressure-tight joints without the use of a sealer. Military Aeronautical pipe thread specifications cover tapered external and internal threads only. The thread form is identical to American Standard, but the gaging procedures specified provide very close control of the various dimensions. A sealer is necessary to insure a pressure-tight joint.

American Standard Taper pipe threads have maximum and minimum flats which are the same for both crest and root of both mating parts as shown in Table II. If the crest flats are larger than the adjacent root flats, a clearance results between the flats as shown in Fig 2. This clearance must be filled with a sealing compound if spiral leakage is to be avoided. Fig 2 shows the maximum-clearance condition.

If, on the other hand, the mating parts happen to have minimum-crest flats adjoining maximum-root flats at both the major and minor diameters of the thread, an interference results. When such a joint is made up wrench tight, the crests are crushed into the roots of the mating part, resulting in a sealed joint as shown in Fig 3 (maximum interference). This condition is usually not obtained on commercial fittings.

Taps — Internal American Standard Taper pipe threads are generally pro-

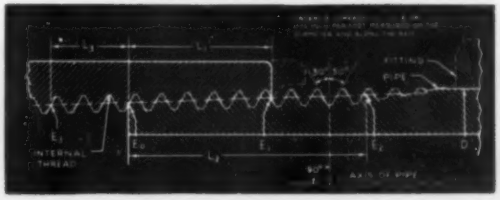


Fig. 1

TABLE I . . . BASIC PIPE-THREAD DIMENSIONS COMMON TO:
(1) American Standard, (2) American Standard Dryseal, and (3) Military Aeronautical Specifications

APPLIES TO	NOMINAL PIPE SIZE AND THREADS PER INCH	OUTSIDE DIA. OF PIPE D	PITCH DIAMETER AT SMALL END OF EXTERNAL Thread E_0	HAND ENGAGEMENT			EFFECTIVE THREAD EXTERNAL			WRENCH MAKE-UP LENGTH FOR INTERNAL THREADS		
				Pitch Diameter E_1	Length L_1		Pitch Diameter E_2	Length L_2		Pitch Diameter E_3	Length L_3	
		Inches	Inches	Inches	Inches	Threads	Inches	Inches	Threads	Inches	Inches	Threads
①②③	1/16—27	0.3125	0.27118	0.28118	0.160	4.32	0.2875	0.2611	7.05	0.2642	0.1111	3
①④③	1/8—27	0.4050	0.36351	0.37476	0.180	4.86	0.3800	0.2639	7.12	0.3566	0.1111	3
②④				0.37360	0.1615	4.36						
①④③	1/4—18	0.540	0.47739	0.48989	0.200	3.60	0.5025	0.4018	7.23	0.4670	0.1667	3
②				0.49163	0.2278	4.10						
ALL THREE SYSTEMS	3/8—18	0.675	0.61201	0.62701	0.240	4.32	0.6375	0.4078	7.34	0.6016	0.1667	3
	1/2—14	0.840	0.75843	0.77843	0.320	4.48	0.7918	0.5337	7.47	0.7450	0.2143	3
	3/4—14	1.050	0.96768	0.98887	0.339	4.75	1.0018	0.5457	7.64	0.9543	0.2143	3
	1 —11-1/2	1.315	1.21363	1.23863	0.400	4.60	1.2563	0.6828	7.85	1.1973	0.2609	3
	1-1/4—11-1/2	1.660	1.55713	1.58338	0.420	4.83	1.6013	0.7068	8.13	1.5408	0.2609	3
	1-1/2—11-1/2	1.900	1.79609	1.82334	0.420	4.83	1.8413	0.7235	8.32	1.7798	0.2609	3
	2 —11-1/2	2.375	2.26902	2.29627	0.436	5.01	2.3163	0.7565	8.70	2.2527	0.2609	3
①	2-1/2— 8	2.875	2.71953	2.76216	0.682	5.46	2.7906	1.1375	9.10	2.7039	0.2500	2
②④③										2.6961	0.3750	3
①	3 — 8	3.500	3.34062	3.38850	0.766	6.13	3.4156	1.2000	9.60	3.3250	0.2500	2
②④③										3.3172	0.3750	3
①	3-1/2— 8	4.000	3.83750	3.88881	0.821	6.57	3.9156	1.2500	10.00	3.8219	0.2500	2
①	4 — 8	4.500	4.33438	4.38712	0.844	6.75	4.4156	1.3000	10.40	4.3188	0.2500	2
①	5 — 8	5.563	5.39073	5.44929	0.937	7.50	5.4786	1.4063	11.25	5.3751	0.2500	2
①	6 — 8	6.625	6.44609	6.50597	0.958	7.66	6.5406	1.5125	12.10	6.4303	0.2500	2

① American Standard ② Dryseal Pipe Threads ③ Aeronautical Pipe Threads

NOTE: Dimensions for 3½" and larger nominal size are for American Standard Pipe Threads only.

TABLE II . . . LIMITS ON CREST AND ROOT WIDTH—EXTERNAL AND INTERNAL THREADS

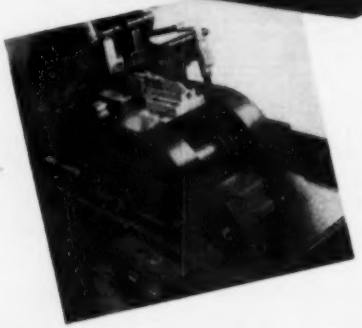
THREADS PER INCH	F	
	Max.	Min
27	.0041	.0014
18	.0057	.0021
14	.0064	.0027
11-1 2	.0073	.0033
8	.0090	.0048

COST REDUCTION thru faster, continuous broaching of multiple parts

● Wherever metal is removed on duplicate small parts you are apt to find a place where Footburt Surface Broaching Machines can cut manufacturing costs. Production is high, and tool maintenance is low in cost per piece. We have had many years of experience in designing the tooling for various types of parts and will gladly advise you in applying surface broaching to your work.

THE FOOTE-BURT COMPANY ● Cleveland 8, Ohio

Detroit Office: General Motors Building



● Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

FOOTBURT

machine tools

Pipe Threads...II

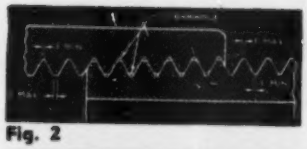


Fig. 2

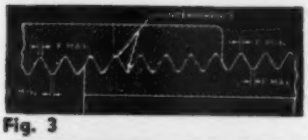


Fig. 3

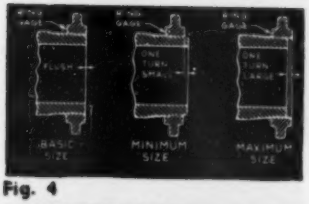


Fig. 4

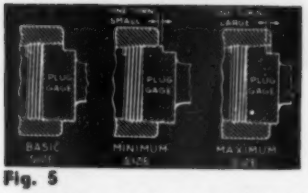


Fig. 5

duced with standard ground-thread taps marked NPT.

Gaging—External American Standard Taper pipe (NPT) threads are gaged with Standard NPT L-1 (thin) ring gages. The ring is screwed up tight by hand on the external thread, and correct size is indicated if the gaging face is not more than one turn, large or small, from being flush with the end of the product thread as shown in Fig 4. The part should have a minimum of approximately three threads with full roots past the large end of the ring gage to allow for wrench make-up (See L-2 length in Table I).

Internal American Standard Taper pipe (NPT) threads are gaged with standard NPT L-1 plug gages. The plug gage is screwed up tight by hand into the fitting or coupling, and correct size is indicated when the gaging notch is not more than one turn, large or small, from being flush with the end of the part (see Fig 5). On chamfered fittings, the gaging reference should be to the intersection of the pitch line with the chamfer cone, rather than to the end of the part. As the gaging notch is located at the pitch line of the gage, its position in relation to the chamfer cone is easily noted. Parts which do not have a clearance beyond the thread should have approximately three full threads below the small end of the L-1 plug gage to allow for wrench make-up (see L-3 length in Table I).

AMERICAN STRAIGHT PIPE THREADS

Several types of American Standard Straight pipe threads are commonly used, the choice depending upon the service for which they are intended. Most of them have the same basic thread form and dimensions as American Standard Taper pipe threads and are usually designated by NPS, with an additional letter added to indicate the exact type of thread (NPSM, NPSC, etc.)

NPSC — Many low-pressure pipe couplings are made with American Standard Straight pipe coupling internal threads, and assembled with tapered (standard NPT) external threads, using a suitable sealer. Such joints are not recommended if subject to vibration or a rigid connection is required.

TABLE III . . . DIMENSIONS, EXTERNAL AND INTERNAL STRAIGHT PIPE THREADS FOR MECHANICAL JOINTS

Nominal Pipe Size and Threads per Inch	External Thread					Internal Thread				
	Major Diameter		Pitch Diameter		Minor Diameter	Major Diameter	Pitch Diameter		Minor Diameter	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1/8—27	.3995	.3926	.3748	.3713	.3501	.3995	.3783	.3748	.3570	.3501
1/4—18	.5269	.5165	.4899	.4847	.4529	.5269	.4951	.4899	.4633	.4529
3/8—18	.6640	.6536	.6270	.6218	.5900	.6640	.6322	.6270	.6004	.5900
1/2—14	.8260	.8126	.7784	.7717	.7308	.8260	.7851	.7784	.7442	.7308
3/4—14	1.0365	1.0231	.9889	.9822	.9413	1.0365	.9956	.9889	.9547	.9413
1 —11-1/2	1.2965	1.2802	1.2386	1.2305	1.1807	1.2965	1.2468	1.2386	1.1970	1.1807
1-1/4—11-1/2	1.6413	1.6250	1.5834	1.5753	1.5255	1.6413	1.5916	1.5834	1.5418	1.5255
1-1/2—11-1/2	1.8802	1.8639	1.8223	1.8142	1.7644	1.8802	1.8305	1.8223	1.7807	1.7644
2 —11-1/2	2.3542	2.3379	2.2963	2.2882	2.2384	2.3542	2.3044	2.2963	2.2547	2.2384
2-1/2— 8	2.8455	2.8221	2.7622	2.7505	2.6789	2.8455	2.7739	2.7622	2.7023	2.6789
3 — 8	3.4718	3.4484	3.3885	3.3768	3.3052	3.4718	3.4002	3.3885	3.3286	3.3052
3-1/2— 8	3.9721	3.9487	3.8888	3.8771	3.8055	3.9721	3.9005	3.8888	3.8289	3.8055
4 — 8	4.4704	4.4470	4.3871	4.3754	4.3038	4.4704	4.3988	4.3871	4.3272	4.3038
5 — 8	5.5326	5.5092	5.4493	5.4376	5.3660	5.5326	5.4610	5.4493	5.3894	5.3660
6 — 8	6.5893	6.5659	6.5060	6.4943	6.4227	6.5893	6.5177	6.5060	6.4461	6.4227

TABLE IV—DIMENSIONS, EXTERNAL AND INTERNAL STRAIGHT PIPE THREADS FOR LOCKNUT CONNECTIONS

Nominal Pipe Size and Threads per Inch	External Thread					Internal Thread				
	Major Diameter		Pitch Diameter		Minor Diameter	Major Diameter	Pitch Diameter		Minor Diameter	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1/8—27	.4087	.4018	.3840	.3805	.3593	.4110	.3898	.3863	.3685	.3616
1/4—18	.5408	.5304	.5038	.4986	.4668	.5443	.5125	.5073	.4807	.4703
3/8—18	.6779	.6675	.6409	.6357	.6039	.6814	.6496	.6444	.6178	.6074
1/2—14	.8439	.8305	.7963	.7896	.7487	.8484	.8075	.8008	.7666	.7532
3/4—14	1.0543	1.0409	1.0067	1.0000	.9591	1.0588	1.0179	1.0112	.9770	.9636
1 —11-1/2	1.3183	1.3020	1.2604	1.2523	1.2025	1.3237	1.2739	1.2658	1.2242	1.2079
1-1/4—11-1/2	1.6630	1.6467	1.6051	1.5970	1.5472	1.6685	1.6187	1.6106	1.5689	1.5526
1-1/2—11-1/2	1.9020	1.8857	1.8441	1.8360	1.7862	1.9074	1.8576	1.8495	1.8079	1.7916
2 —11-1/2	2.3759	2.3596	2.3180	2.3099	2.2601	2.3813	2.3315	2.3234	2.2818	2.2655
2-1/2— 8	2.8767	2.8533	2.7934	2.7817	2.7101	2.8845	2.8129	2.8013	2.7413	2.7179
3 — 8	3.5031	3.4797	3.4198	3.4081	3.3365	3.5109	3.4393	3.4276	3.3677	3.3443
3-1/2— 8	4.0034	3.9800	3.9201	3.9084	3.8368	4.0112	3.9396	3.9279	3.8680	3.8446
4 — 8	4.5017	4.4783	4.4184	4.4067	4.3351	4.5095	4.4379	4.4262	4.3663	4.3429
5 — 8	5.5638	5.5404	5.4805	5.4688	5.3973	5.5716	5.5001	5.4884	5.4285	5.4051
6 — 8	6.6205	6.5971	6.5372	6.5255	6.4539	6.6283	6.5567	6.5450	6.4857	6.4617

WATSON-STILLMAN

Cold Extrusion Press

9-M-56

HYDRAULIC POWER becomes *Fire Power*

QUICKLY...
EFFICIENTLY...ECONOMICALLY

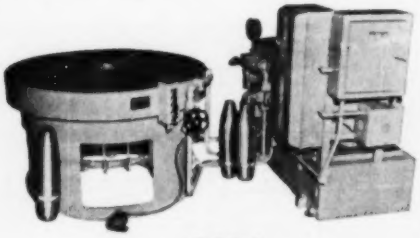
with W-S ORDNANCE PRESSES

W-S Hydraulic Press flexibility of control is a natural for the precision required in shell forging manufacture. Combine this control with the economy of using only the press tonnage and stroke required and the exactly suitable speed and you have the answer to every pressing operation.

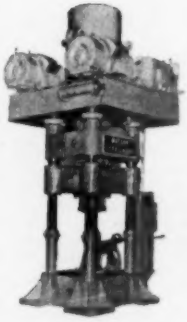
Reject percentage drops instantly, noise levels decrease, maintenance problems become insignificant when hydraulics take over your Ordnance press jobs. And hydraulics, of course, have been synonymous with Watson-Stillman for more than a century.

Write now specifying your type and size of shell for today's W-S Press recommendations . . . it's backed by 104 years of hydraulic experience.

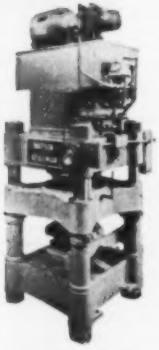
Shell Piercing Press



Shell Bunder



Shell Nosing Press



Billet Breaker

Branch Office:
228 N. La Salle, Chicago, Ill.

W-S HYDRAULIC

Manufactured in Canada by
Canadian-Vickers, Ltd., Montreal

Factory and Main Office:
HYDRAULIC MACHINERY DIVISION

WATSON-STILLMAN

ESTABLISHED 1848

ROSELLE, NEW JERSEY

W-S "Completeline" Hydraulics . . . The Shortest Distance From Production to Profits

Pipe Threads...III

NPSC pipe couplings are usually tapped in high-production machines requiring special taps, and such tools must be made to the customer's specifications. For special applications, standard basic straight pipe taps will produce satisfactory holes for assembly with tapered pipe threads.

Gaging procedure for straight pipe thread couplings is the same as for tapered threads, using NPT-L1 plug gages, except that the tolerance is 1½ turns, large or small, rather than 1 turn as in checking tapered threads.

NPSM — The American Standard Straight pipe thread for free-fitting mechanical joints (NPSM) is used for assembling pipe and fittings which are not required to withstand fluid pressures. Such joints consist of straight internal and external threads made to the limits shown in Table III.

Standard basic straight pipe taps are used to produce threaded holes to the specified limits, while straight go and not-go thread plug gages and thread ring gages are used for gaging. These gages are special and are made to the product pitch diameters shown in Table III.

NPSL — The American Standard Straight pipe thread for locknut connections (NPSL) is used where a loose-fitting connection is desired. It was developed for the seal joint commonly used in tank nipple connections. The internal thread will assemble freely with the largest full thread which can be cut on the outside diameter of a standard pipe. Thread dimensions are shown in Table IV.

Oversize straight pipe taps for tapping pipe locknut threads and the straight go and not-go thread plug and ring gages are special and are made to the product pitch diameters shown in Table IV.

DRYSEAL PIPE THREADS

American Standard Dryseal pipe threads are used for both external and internal threads where a pressure-tight joint is required and the use of a sealer may be objectionable. The external threads are tapered while the internal threads may be tapered or straight.

Dryseal threads, in most cases, have the same basic dimensions as American Standard pipe thread (see basic dimensions Table I), except the crest and root truncations are modified to produce a pressure-tight joint.

American Standard Dryseal pipe threads have crest flats which are equal to or smaller than the root flats of the mating part as shown in Table V. When fittings producing the minimum-interference condition as shown in Fig 6 are assembled, a complete mating of the form results so all spiral leakage is eliminated.

In the maximum-interference condition, Fig 7, a clearance results at the flank of the thread when the joint is made up hand-tight. This clearance is eliminated by a crushing of the crests and roots when the joint is screwed up wrench-tight so complete mating of the form again results.

Pipe joints consisting of American Standard Dryseal Taper internal and external threads (NPTF) are generally considered to be superior for strength and sealing as compared to joints using straight internal (NPSF or NPSI) and tapered external (NPTF) threads.

TABLE V . . . CREST AND ROOT FLATS OF AMERICAN STANDARD DRYSEAL THREADS

THREADS PER INCH	ROOT FLAT		CREST FLAT	
	Max.	Min.	Max.	Min.
27	.006	.004	.004	.002
18	.007	.005	.005	.003
14	.007	.005	.005	.003
11-1 2	.009	.006	.006	.004
8	.011	.008	.008	.006

Taps—The internal threads for such joints are produced with Standard Dryseal Taper pipe taps (NPTF). These are furnished with ground threads and dimensions identical to American Standard Taper pipe taps (NPT) except for the large crest flat and slight difference in the maximum root flat.

Gaging—Although there is very little difference between NPT and NPTF threads, it is necessary to control the various thread dimensions within specified dryseal tolerances so leak-proof joints are assured.

Thread plug and thread ring gages are used for checking size and taper. Thread form and truncation may be checked by projecting a percentage of the product or chasers on an optical comparator in the case of external threads, and by similar inspection of the taps themselves in the case of internal threads. Casts of internal threads can be projected, but this method is not practical for extensive use. Taps used under reasonable conditions reproduce their own form quite accurately so inspection of the tools together with proper use of plug gages will insure properly-threaded holes.

Gages—NPTE basic L-1 tapered plug and ring thread gages are used to check the portion of the threaded product normally engaged by hand. These gages are similar to standard NPT gages except the thread crests are truncated an additional amount to clear the wide roots in the Dryseal thread. The L-1 plug gages normally have a basic step, but can be supplied with limit steps (max and min) if the limit method of gaging is to be used. L-1 ring gages can also be supplied with limit steps where required.

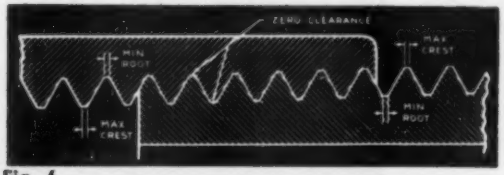


Fig. 6

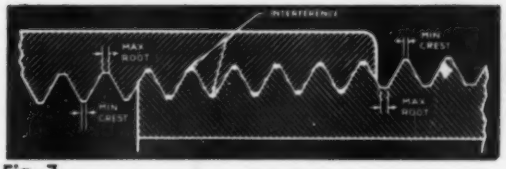
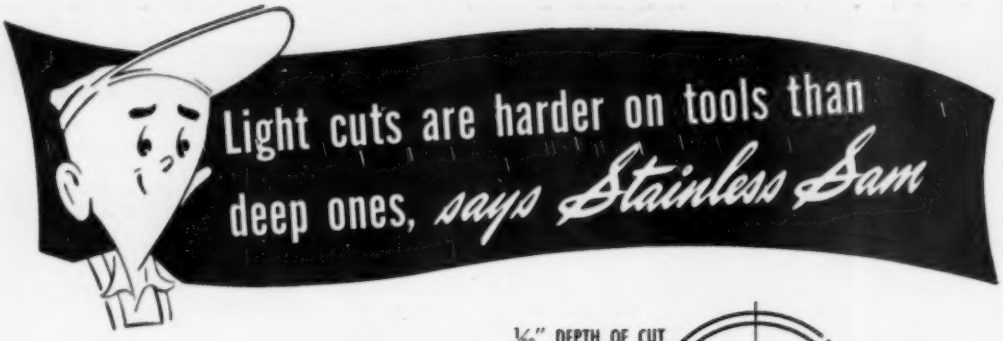


Fig. 7

Continued in next issue

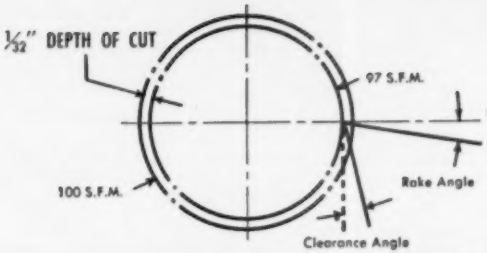


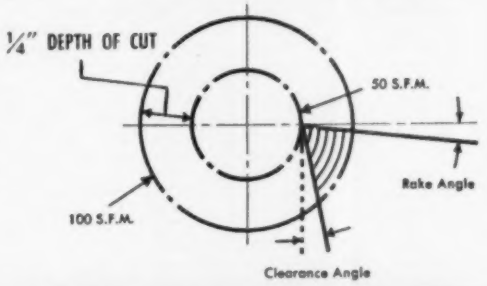
Remember this: Light cuts on stainless steels reduce tool life because tool tips break down from excessive heat.

As an example, Stainless Sam cites a turning operation on a 1-inch bar of stainless steel in an automatic screw machine. Let's assume that the surface speed of the bar is 100 feet per minute. When you take a 1/32-inch deep cut, the tip of the tool is cutting at a rate of 97 SFM.

On the other hand if you make a 1/4-inch deep cut, the speed at the tool tip will be only 50 SFM. As a result, the 1/4-inch cut generates less heat in the tool tip than the 1/32-inch cut at 97 SFM.

Of course, the *total* heat generated during the 1/4-inch cut is greater than for the 1/32-inch cut, but more heat is being dissipated into the body of the tool. It is not concentrated in the tip, the weakest portion of the cutting edge.

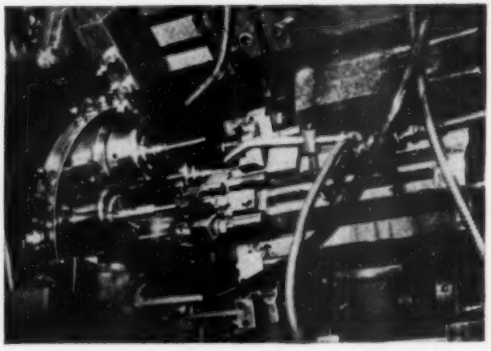




Select the right tool type

Because tool-tip life is so important, Stainless Sam recommends Carbides, Cast Alloys and High Cobalt tool steels for finish-turning stainless steels with very light cuts, yet recommends High-Speed and High-Speed Cobalt tool steels for low-speed turning with heavy feeds and deep cuts.

This is the kind of information you'll find in the booklet, "Machining of Armco Stainless Steels." Ask your Armco Distributor for a copy. It will serve you well.



ARMCO STEEL CORPORATION

4642 Curtis Street, Middletown, Ohio • Plants and sales offices from coast to coast • Export: The Armco International Corporation

ARMCO

TALKING SHOP

Rigidity Counts

RIGIDITY and proper tool setting are frequently more important in removing metal than is power. For example, Hardinge mills cast iron at 2300 sfpm with a single-tooth, 4¾-in.-dia carbide flycutter at ¼-in. depth of cut and 0.0037 ipr feed at 1850 rpm with only ¾ hp—a job that requires 6.8 hp according to available formulas. The flycutter bit has 0 rake, 6° side clearance, 6° peripheral clearance, and a 45° corner chamfer. But the miller is very rigid . . . On the new toolroom lathe, single-point tools of carbide with 6° positive side rack, 0° back rake, or HSS with 15° side rake and 3° back rake can cut heavy blue chips 5/16 in. deep from CRS at 3000 rpm, and stainless at about 1400 rpm with only 1 hp. Again, the answer is rigidity and proper tool setting.

Engineers Gain

FORTY PERCENT of industrial management is now engineer-trained, according to a recent Columbia University survey, replacing both the lawyer and the banker in top industrial posts. A logical development, indicating a very practical trend that may help to keep costs down. May indicate, too, that more engineers are learning enough law and finance to understand that end.

Not Boring

A RECENT Government order included the requirement for a 0.3646-in. hole in a zinc-base die casting to have a finish within 5 mu-in. rms. The hole was cored, and boring and honing were indicated. However, core drilling and reaming were found to give a finish within 3.5 mu-in. rms, and size within the tolerance of 0.0004 in.

Paper Pitches In

MONARCH MACHINE TOOL CO hasn't sufficient engraving capacity to mark accurately the arcuate scales on slides for setting toolslides of right-angle (T) lathes at various angles with relation to cross slides. They're needed in some quantity too. So Monarch has gone to a local newspaper with modern photoengraving facilities. Scales are photoengraved on slide top faces during off hours—they're trucked to the newspaper plant in the evening, brought back the next morning.

Kazoo

HAMMOND MACHINERY BUILDERS, celebrating its 70th anniversary, has issued "Life Is Good in Kalamazoo," which is just what its name indicates—a story about the town rather than the company, yet building the company phrase, "Hammond of Kalamazoo."

Perfect Eyes

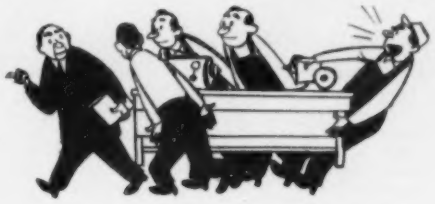
ONE GOVERNMENT CONTRACTOR making precision optical instruments found one girl and one supervisor with eyesight supremely suitable for the work. The supervisor could adjust a finished instrument more accurately than anyone else; the girl was better at cleaning and assembling optical elements than anyone else. The plant manager called in an oculist and said, "Grind glasses for other people here so their eyes will do what these two people's will." Examination showed it was not only 20/20 vision, but also absence of any other faulty conditions like astigmatism and unbalance. Even with glasses where needed, it was found essential to maintain 60-footcandles light on the working plane and a dust-free atmosphere.

Ingenuity

NOTHING FOULS UP a company's methods department and its job-instruction sheets more than good old American ingenuity. The problem is to get the benefits of ingenuity without its looseness. One company has solved the problem by paying for ideas but insisting that they be okayed first by Methods. If they aren't, the time required for reworking the job according to job instructions is charged to the worker. Also, production departments are not permitted to maintain files of prints or methods sheets on regular jobs. New and corrected prints and sheets come out with the job and corrections are marked if the job is familiar—so there's no trouble with failure to follow a change in specs. Engineering drawings contain no descriptive terms such as "drill" or "mill" unless there is no other way to do the job. Normally, the methods man is allowed to choose machining method as long as required dimensions and finish are attained. What's more, prints show final dimensions in all cases; the methods man must make his own allowances for finishing, paint or plating buildup, and the like.

Grab Check

TO KEEP PRODUCTION and assembly department on their toes, the laboratory at Hardinge Bros has authority directly from the vice-president in charge of engineering to take any lathe or miller, just completed, for an arbitrary spot check. Lab-test results are then compared directly with shop-test results to discover disparities, if any. Shop men never know which machine or type will be grabbed next, and no regular cycle is followed, so any deviation from standards may be caught.



News of Metalworking

REYNOLDS CUTS AL POTS

LONGVIEW, Wash — Power shortages have forced Reynolds Metals Co to shut down 41 of its 372 aluminum pots at its reduction plant here. Previously, both Alcoa and Kaiser had curtailed operations for the same reason.

DOUGLAS LABOR SETTLED

EL SECUNDO, Calif—AFL Machinists' union and Douglas Aircraft have reached agreement on a contract, subject to union-membership and WSB approval. The agreement grants a 5¢ hourly increase plus fringe benefits, which include a 2¢ cost-of-living hike converted into a permanent rate.

E C BAIN RECEIVES MEDAL

PARIS—La Societe Francaise de Metallurgie bestowed its highest honor, the Grand Medal, on Dr E C Bain, vp, Research & Technology, United States Steel Co, for his work with steel alloys. Dr Bain is the first American to receive this medal.

RESEARCH SOCIETY MEETS

WASHINGTON — The first regular meeting of the Operation Research Society of America will consist of a panel discussion of new methods and problems, following its aim to apply scientific methods to business and military problems. Meeting time will be Nov 17 and 18 at the National Bureau of Standards.

Metal Show Racks Up Big Attendance, Not So Much Big News

PHILADELPHIA — The 34th National Metal Congress and Exposition, October 20 through 24, boasted an attendance of 45,000, largest in the history of the event.

Welding equipment and instruments took the spotlight. Air Reduction's display of its new Heliweld hard-facing process, Travograph 50, and CO_2 cooling (*AM*—Mar 3 '52, p 129) attracted large crowds. Linde's flame-plating technique (*AM*—Sept 29 '52, p 152) could not be demonstrated, but samples of the finished work aroused considerable interest. Nelson Stud Welder showed a close-tolerance, heavy-duty, stud-welding machine with a universal swivelling head that is adjustable to 3 ft above the table, and with the column adjustable to four positions on the table.

Cincinnati Milling's Flamatic Div had a demonstration of flame-hardening refrigerator crankshafts using natural gas. Work was surfaced to a maximum hardness—45 to 55R_c—up to a flange in a 12-sec heating cycle. City gas was recompressed from 1 psi to 15 psi for desired flow to the burners.

Leeds & Northrup demonstrated a new Rayotube detector which measures temperatures by sighting directly on the work during induction heating, making possible automatic control. It can measure a target area as small as 0.1 in. by sighting between the heater coils, and detects 99% of a change in 0.6 sec.

A new X-ray technique for identification and quantitative analysis of minute amounts of elements present in thin films or small deposits was shown by North American Philips. The instrument consists of a standard X-ray spectrograph employing tungsten radiation, but using a special analyzing crystal with newly developed optics.

Wm J Hacker & Co exhibited the Reichert metallographic microscope featuring interchangeable binocular and monocular tubes. With this instrument it is possible to work with reflected light with bright and/or dark fields, or with polarized light. The same company also showed a Model K microtome, made by Jung, Heidelberg, capable of slicing metallic specimens for metallographic examination as thin as 2 microns.

A Vickers projection microscope was displayed by the R Y Ferner Co. It is said to be the first metallograph of vertical design. The stage will hold work weighing up to 50 lb, and normal, polarized, or transmitted light may be used. An interesting feature is that the instrument may be used for measuring surface finish

TITANIUM ATTRACTED WIDE ATTENTION. R S Nycum (second from left) ass't gen mgr, Titanium Corp talks with Everett Yeaw, Jr, procurement (left), B Whitman, buyer and T D Webb, planning dep't, all of Jacobs Aircraft Engine Co

EARL D HILBURN, CHIEF OF ENGINE DESIGN, US ARMY ENGINEERS, Ft Belvoir (left), had some important questions to ask of Virgil Bullen, mgr, Flamatic Div, Cincinnati Milling Machine Co

A K SEEMANN (LEFT), MANAGER OF FLAME PLATING, LINDE AIR PRODUCTS CO, discusses the merits of flame-plated tungsten carbide with M A Seibert, owner, M A Siebert Co, Boston

without contact with the work. One or more lines are projected onto the work and readings can be taken as small as 0.1 mu in. Also shown by the same company was a universal fatigue testing machine for push-pull, torsion, bending, or any combination of these. Made by Schenck, Darmstadt, Germany, the machine features a program-control system to permit automatic variations in load direction or intensity.

Some interesting milling machines by Adcock & Shipley, England, were shown by Crowther & Hughes. These were available with interchangeable vertical and horizontal spindles and with automatic cycling, for which the table is operated by a separate motor. The same company also showed the Aloris toolpost and toolholders which fit on a standard lathe cross-slide and permit rapid tool changes without adjustment. Each toolholder can be set to exact height by a built-in jack screw.

Leon G Arpin demonstrated the Microturn, a simple device for quick attachment to a lathe cross-slide to permit fine adjustment. A micrometer dial is graduated so one mark represents an advance or retraction of the tool of 0.00005 in.

American Metaseal Corp displayed a completely new, self-contained unit for sealing metal castings. The unit comprises autoclaves, high-vacuum pump, thermostatically controlled surge tanks, mechanical surging unit, and power-operated hoist. One man can handle the entire sealing operation, and there is no individual part handling during the process. Exclusive of baking oven, the unit occupies less than 40 sq ft of floor space.

CALENDAR OF MEETINGS

Nov 11-14—Montreal Tool & Equipment Show; Show Mart Bldg, Montreal, Canada.

Nov 20-21—American Society for Quality Control, 7th midwest conference; Claypool Hotel, Indianapolis, Ind.

Nov 20-21—Society for Advancement of Management, 2nd annual Work Measurement Clinic, "Modern Utilization of Time Study." Hotel Syracuse, Syracuse, NY.

Dec 1-5—American Society of Mechanical Engineers, annual meeting; Hotel Statler, New York.

Dec 3-5—Society for Experimental Stress Analysis, annual fall meeting; Hotel McAlpin, New York.

B&O SCANS TV TO MAKE UP TRAINS

CHICAGO—Three small RCA Vidicon industrial television cameras kill off plenty of walking in freight-yard work for B&O. Two scan the yard for an overall view, while one remote unit is set up next to a single track so office viewer can monitor car numbers to control switching.

Capital Spending for '53 — Only Small Plants are Cutting Heavily

NEW YORK—Preliminary plans for capital expenditures next year, indicated by a McGraw-Hill Economics Department survey, are down 8% from this year, but still 6% over 1951 spending. While the larger companies are planning to continue expenditures for new plant and equipment, the smaller ones are slowing down.

Metalworking industries plan to spend about 11% less than this year. Largest decline is in transportation-equipment industries, with aircraft fairly well situated right now for capital goods, and the auto industry only planning mild spending for next year.

Electrical manufacturing is the exception to the slight downward trend, but this industry spent less this year than planned, and will make up in '53 for the '52 gap in its original plans.

Non-manufacturing industries will increase capital spending next year. This balances the drop in manufacturing spending somewhat.

The survey of future plans (not a forecast) showed a large amount of diversity in outlook. For example, while the machinery industry is reducing spending a little, some subdivisions like office equipment intend to expand more. The general trend is that business is not thinking now about sharp cutbacks, but will continue high-level spending through next year.

CAPITAL SPENDING BY MANUFACTURERS OFF 8% METALWORKING DOWN 11% FROM PEAK

	Millions of Dollars			% Change
	1951	1952	1953	'52-'53
Steel	$ 1304	$ 1718	$ 1428	-17
Machinery	675	773	661	-14
Electrical Mfg	359	407	468	+15
Automobiles	736	909	791	-13
Transportation	182	229	144	-37
Food	968	933	998	+ 7
Textiles	695	491	417	-15
Petroleum	2014	2812	2967	+ 5
Chemicals	1283	1503	1301	-13
Other Mfg	2914	3033	2578	-15
All Mfg	11,130	12,808	11,753	- 8

1951, 1952 figures from Dep't of Commerce

IMPROVED TACTICAL BRIDGE DEVELOPED BY ARMY

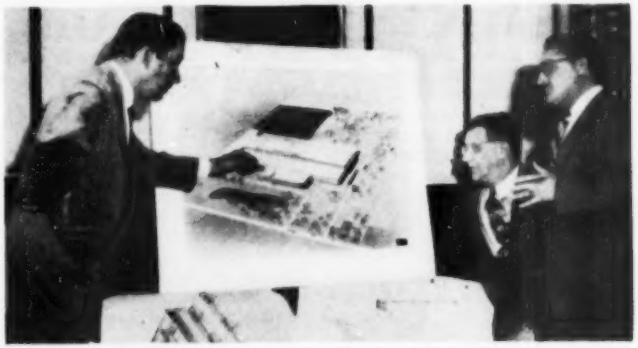
FT BELVOIR, VA—Army engineers cooperating with Aluminum Co of America and Pittsburgh-Des Moines Steel Co have produced a new aluminum bridge for carrying divisional equipment over spans as wide as 180 ft. Erection time of the new T-6 is much under that for a Bailey type, and weight is down about 60% under conventional steel bridge.

DAYTON ROGERS MARKS 30 YEARS

MINNEAPOLIS—Dayton Rogers Co is celebrating 30 years in the metalworking field. The company's 65,000-sq-ft plant, employing 350 workers, produces precision die-cut stampings, averaging 450 to 500 new die designs each month.

TWO PLANTS CONSIDER ALUMINUM

NEW YORK—Wheland Co of Chattanooga, Tenn, and Olin Industries, Inc, of E Alton, Ill, are both in the running as new primary producers of aluminum. Wheland is negotiating for the purchase of a plant, while Olin is still in preliminary talks on the subject with DPA. The only other aluminum producer outside of the big three is Anaconda Copper, which is cooperating with Harvey Machine Tool Co in building new facilities for ore reduction.



FRANCIS J. TRECKER, Kearney & Trecker president (right) checks plans for new plant with Brooke Stevens, industrial designer who planned the offices, and Henry H Lentzner, manager, K&T special machinery division

Kearney & Trecker Building Plant To Make Special Millers

MILWAUKEE—Only special types of milling machines and special adaptations of standard millers will be built by Kearney & Trecker Corp in a new one-story, 200,000-sq-ft plant to be erected on the outskirts of this city 3 miles from K&T's main plant.

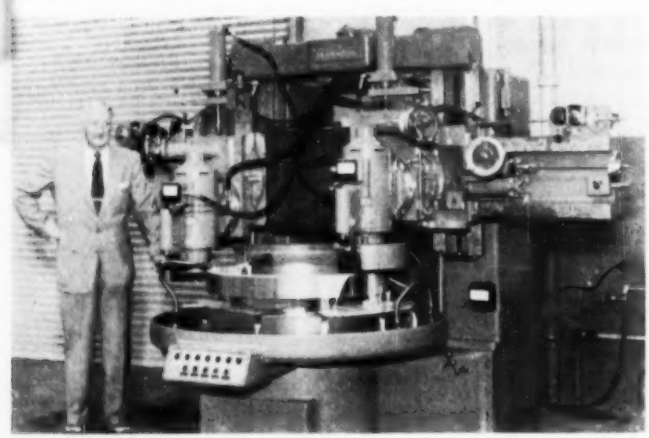
Construction will begin early next year and production probably will be under way next June or July. Total cost will be $5,232,000, including $2,500,000 for machine tools.

The plant will turn out, at the beginning, about $5 million a year of special milling machines, compared with current production of $1-2 million. The plant will have capacity for building twice that volume, if sufficient demand should develop. It thus will add considerably to the nation's capacity to produce big machine tools (popularly referred to as "elephants" by Washington).

NPA has made a special allocation of structural steel to build the plant, which eventually will employ 400 people, 80% of whom will be skilled machinists and assemblers.

"While defense requirements will have first call on the new facilities, a large share of the production will be available for civilian-goods manufacture," Francis J. Trecker, K&T president, told AMERICAN MACHINIST. "The government is interested in developing additional defense capacity to be available in an emergency, rather than in immediate use of the capacity itself. We are free to take business from any source whatsoever."

Large components, such as beds, tables and columns, will be machined in the new K&T plant. All other parts for special machines (like gears, spindles and leadscrews) will continue to be made in the main plant at West Allis and shipped for assembly to the new plant. This combination of production in the new factory with that in the existing plant will make possible the achievement of full output in the new factory as soon as possible.



CUPOLA BEARINGS FOR M-48 PATTON TANK will be ground by five of these Frauenthal 48-in. precision grinders at Ford Tank Plant, Livonia, Mich. Machines were ordered on preliminary design in June '51

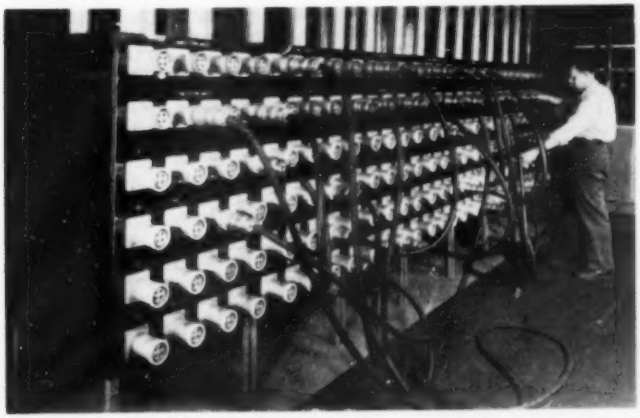
FLOOR-TRACKED DOLLIES ARE AVAILABLE for moving large, finished lathes from the erection floor to painting, crating, and loading areas where a cross-traveling crane does the necessary lifting and moving

Monarch Revamps Production Line, Adds New Plant for T-Lathes

SIDNEY, O—An added 43% of new floor space and modernization of 25% of the old Monarch Machine Tool Co plant has been completed to handle a pool order for several hundred tracer-controlled T-lathes that are on order for jet-engine work.

Major changes in the production lineup include a realignment of machines to allow departmental manufacture of major lathe components. Such departments manufacture completely such parts as headstocks, tailstocks, aprons, and beds. These are arranged plant-wise so manufacturing is almost a straight-line operation, approaching mass-production techniques.

The new South building was a conventional erection, but the West building required strengthening to support the higher weight of the new lathes. The new structure was actually built over the old bays, which were torn down during the plant vacation. Old equipment was relocated and 77 new machines were installed at the same time. Some 350 machines were involved.



DISTRIBUTION BOARD CARRIES 100 NUMBERED RECEPTACLES to connect to floor outlets on assembly floor. Four transformers, a cycle generator, and an m-g set supply ac and dc. Combinations include 3-wire, 3-phase; or 4-wire, 2-phase ac from 25 to 60 cycles and 150 to 750 v, plus any desired dc voltage

Quality-control facilities include a chemical lab, a metallurgical room, gear-control area, and experimental heat-treat. Grouped around this center are production plating, finishing, heat-treat, and gear departments; also the spindle department.

Six final-assembly lines are fed south-to-north, and include 135 erection stations where final assembly is done. Testing facilities are unusually varied, and include triple floor outlets for compressed air and ac power of any phase, frequency, and voltage.

Stock rooms are located directly under the production floor, and arranged with parts grouped for each different lathe component.

ALUMINUM CONCENTRATION ON WEST COAST SEEN

LONGVIEW, Wash—Further expansion of facilities here will be in fabricating, not in ore reduction, according to officials of Reynolds Aluminum Co at ceremonies marking completion of a $7-million expansion program. The Pacific Northwest produces about 45% of the nation's raw aluminum, but the trend now is toward fabricating—as indicated by 150 new metalworking plants in the area. Pig aluminum, it is expected will no longer be sent east as the industry grows.

TIN-CAN RESEARCH CROPS UP AGAIN

NEW YORK—Two projects, one at New York University, and one at Armour Research Foundation, will investigate the problem of salvaging scarce tin from old cans, and of retaining the steel stock for use as open-hearth scrap.

ASTM INDEXES PAPERS

PHILADELPHIA — The American Society for Testing Materials has issued a 50-year index to technical papers, proceedings of meetings, and books published by the association.

DENHAM RECEIVES PUBLICITY AWARD

DETROIT—Denham & Co, representative of ASTE, has been awarded the American Public Relations Assoc certificate for its activities in connection with the tool-engineers' show in Chicago last March. This is the first APRA professional award.

Metalworking Abroad

(By McGraw-Hill World News)

British Diesel Engines to US—will be handled by National Supply Co. The Lister engines will be equipped with domestic starters, generators, radiators, and clutches to minimize service difficulties.

Yugoslavia Fair Sells German Products—including $34,000 worth of Mercedes autos. Largest group of sales to Yugoslavia was agricultural machinery.

Japan to Build Military Plane—a light single-engine trainer that can be fitted with rocket launchers and small bombs. Under contract with Fletcher Aviation Corp, Toyo Aircraft will build and sell the 187-mph ship to non-communist nations.

Australian Industrial Expansion—includes US excavators and Towmotor trucks and equipment to be built there under license. British products to be built there soon include gaskets, auto forgings, and front axles.

Holland Can Roll Lead Ingots—up to 11,000 lb and 71 by 71 by 5.9 in. with a new 92-ft precision roller. Daily production is up to 30 tons of sheet 0.039 in. thick with a tolerance of 0.008 in.

Canada Will Make German Tools—in Newfoundland plant, erected under supervision of German experts. Tradename will be MIAG, but supervision during future production, it is believed, will be Swiss.

West German Car Production Up—to 29,000 for September, a new record. This includes only private passenger autos.

Canada Goes Full Blast on Defense, Lets Civilian Metalworking Slide

TORONTO—Orders placed north of the border for Canadian, British, and NATO defense equipment and materials add up to about $6 billion, with delivery dates spanning the next three years. The machine-tool industry alone expects to be busy on defense orders until the end of 1953, with no civilian orders considered. Only exception is tooling for the auto industry in Canada, most of it special stuff.

For the 1952-53 fiscal year, Canada is supplying NATO with $250 million worth of Sabrejet airframes (for England), several types of guns, small arms and ammunition, trucks and jeeps, radar and radio equipment, and training and transport aircraft. Some of this will be drawn from Canadian service stocks; the remainder will be made new. Over $110 million is being spent in training NATO airmen in Canada, too.

Non-Canadian Designs

Foreign companies, mainly US and British, control much of Canadian industry; and many local organizations work under licenses from foreign outfits. The new American-owned Canadair, Ltd, plant at Montreal is constructing North American F-86E Sabres, Lockheed T-33 jet trainers, and Beechcraft T-36 advanced trainers. Canadian Pratt & Whitney, Ltd, also at Montreal, has started a new plant to make the Wasp R-1340 radial engine. Canadian Car & Foundry Co, Ltd, is building North American Harvard training planes at its Fort William, Ont, plant. These are the major US-licensed aircraft products being made in Canada.

Electronics manufacturers, mainly branches of US or British makers, are scheduled for production of anti-aircraft fire controls, other radar products, radio identification sets, radio compasses, and power-driven antennas. On naval products, British design is important because Canada's navy is modeled on the British; in fact, Sir Watson Watt, British radar inventor, is a consultant to the Canadian government on radar matters at present.

In ammunition, at least one company—Sorel Industries, Ltd—is making US naval guns.

Machine Tools

Canadian Machine Tool Builders Association includes seven dominion members, two US companies, and two British concerns, but the bulk of machine tools in place in Canada right now came from this country . . . . . about $12½ million worth in the first four months of 1952. Machine-tool production in Canada will run around $8 million this year, which will include some small orders for US buyers.

Present head of the machine-tool div of the Department of Defense Production is Stan Marsland, with headquarters in Ottawa. During last year and early this year the division ordered tools through a pool, with each Canadian tool builder allotted a portion of each order for the machines it could turn out. Orders for tools in US were placed where deliveries were best; some defense plants placed their orders direct in a mutual-defense-production arrangement between US and Canada.

About 55% of industry is Canadian-owned, with US capital accounting for three-quarters of the foreign-owned companies. However, there is considerable Canadian investment in subsidiary companies, especially the largest ones.

Wages and Labor

There are no price ceilings or wage controls in Canada now. Wages in the machine-tool industry are much under those in US industry, so Canada loses a lot of workers over the border. Average wage for all Canadian manufacturing last summer was $56 a week, for iron and steel products was $63, and in mining was $65.50. Wages generally follow US trends, rising with or slightly after US boosts.

FIRST PIASECKI H-25 ARMY MULE HELICOPTER to be delivered is designed for wounded evacuation and light transport duty. Length is 32 ft.

Skilled workmen is a major problem. Some manufacturers are meeting immigrant trains at Montreal and Toronto, searching for toolmakers and machine operators among newcomers from Europe. Although there is an immigration boom in Canada, machine-tool makers have no industry system for getting workers, nor do the labor unions make an effort to help the situation along this line.

Some metalworking lines are making efforts, though. Personnel have been brought over from Europe by aircraft plants, although the number of men willing to move from England is not large because wages are up there, too.

Minerals

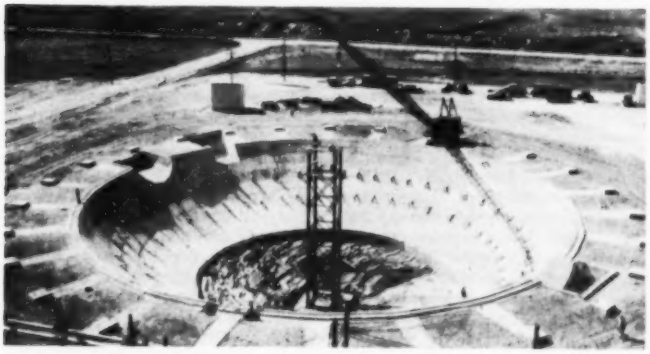
Canada's mineral and oil boom is not affecting Canadian industry much because most equipment is imported from US. Production of metals is going up in all lines except lead. Nickel is up 13% in a year, iron ore 30%, and copper 3%. Most of Canada's metals are used domestically, although the metal products are exported largely to US and England. However, there was a sharp increase in exports of aluminum, copper, nickel, and zinc in the first half of this year.

Cleveland Personnel Survey Checks Fringe Trends

CLEVELAND, O—Management in northeastern Ohio has a fairly simple job of keeping track of the personnel situation. Exhaustive surveys of personnel practices are conducted by the Cleveland Chamber of Commerce (once each 18 months) and The Associated Industries of Cleveland (once a year), each completely separate from the other.

Associated Industries, in its latest survey, reports on 312 companies with 190,000 employees. Some of the important findings are these:

- Present so-called fringe benefits cost Cleveland-area employers about $0.30 per hour—insurance, pensions, vacations, holidays, shift differentials, etc.
- Labor pressure has forced paid vacations to be given, in effect, not with much more time, but with more complexity. The old one week after a year's service and two after five has been replaced widely by vacations based, in days, upon service to the company in six-month increments.
- Insurance-for-employees costs have risen, with many companies paying total insurance bills, some only contributing, and many small companies paying only the administrative costs, with workers taking the full insurance-company charge.
- Pensions stay with the large companies; most companies with 1000 employees have them, but unions are putting the pressure on those with 500 to 1000 workers now.
- Overtime runs to time and a half for Saturdays, double for Sunday, with few taking into consideration the sixth and seventh consecutive day of work as a basis for overtime.



PROTOTYPE ATOMIC POWER PLANT FOR NAVY SUBMARINE will be installed in 179-ft-dia, 42-ft-deep concrete foundation that will support the 225-ft-dia steel sphere that will house the unit. Reactor is being built to test power-plant operation outside of vessel

Distributors Named

The Bellows Co, Akron, Ohio, has acquired exclusive sales and distribution rights for the Locke Drilling and Tapping Unit.

Precision Metalsmiths, Inc, has announced appointment of the Crandall Co as sales representatives. Territories will be handled by Willard Crandall, Dayton; Harry Edwards, Milford, Ohio; and Howard A Meanor, Indianapolis.

Canada Machinery Corp, Ltd, has named Pitman Industrial Products Co, division of Cement & General Corp, its US representative.

A O Smith has appointed Donie Engrg Sales, Indianapolis, distribution agent for Indiana.

Micro Metallic Corp, has named Joseph Whitwell of Claremont, Calif, sales representative for the California area

Stronghold Eastern Corp has designated Allen Price, Long Island City, NY, as representative in Brooklyn and part of the Manhattan territory. James P Quinn, Lyndhurst, Ohio, has been appointed to cover a major portion of the Cleveland area.

Cleco Div of the Reed Roller Bit Co has appointed Harry P Leu, Inc, Orlando, Fla, and Ace Equipment & Supply Co, Hillside, Ill., as distributors in their areas.

Super Tool Co has named W C Sonnie and Douglas E Porter of the Cleveland Carbide Sales Co as representatives for special carbide cutting tools in the Cleveland territory.

Wiedemann Machine Co has announced appointment of Four States Machinery Co, Chicago, as representatives for the company's line of turret punch presses. Territory includes Illinois, Iowa, Indiana, western Michigan and southeast Nebraska.

Bohn Aluminum and Brass Corp has designated Edward F Rau, Manitowoc, Wis, as sales representative with headquarters at Minneapolis, Minn.

Gries Reproducer Corp has announced appointment of A P Metzger of Perrine, Fla, as sales representative for the company.

Billings & Spencer Co has named J B Lyons direct southern sales representative with headquarters in Atlanta, Ga. His territory includes the Virginias, District of Columbia, the Carolinas, Georgia, Florida, Alabama, Kentucky, Mississippi and Tennessee, plus a portion of Maryland.

Gear Association Prepares Streamlined Constitution

CHICAGO, Ill—Previous records for attendance were broken at the semi-annual meeting of the American Gear Manufacturers' Assn at the Edgewater Beach Hotel here October 27-29. There were 215 registrants for the meetings and 325 registrants and their wives at the semi-annual banquet October 28. Technical and committee meetings are now much better attended, and the entire tempo of the meetings has been stepped up. These results, in the words of President Crawshaw, are a tribute to the new organizational structure developed by the society about two years ago. It has been found necessary to revise the constitution and by-laws to take care of the change in organization. Changes are now in the final-draft stage and will be submitted to members shortly for authorization to present for adoption at the Spring meeting next June. The new constitution is unique in several respects. Constitution and by-laws are combined, and a flow chart is included to replace the verbiage which normally explains organizational structure. This flow chart will be changed each administration.

Work on a number of standards was revised at committee meetings:

- New application factors for high-speed gearing tying in with, but amplifying, those of the NEMA will be put in standard 421.02. These standards will also include changed K factors and higher hardnesses. Standards are also proposed on oil-field pumping-unit gearing and on a uniform gearing-selection method.
- Standard 460.03 on gearmotors is ready for adoption as an AGMA standard and the standard on gearmotor motors will be modified to tie in with NEMA changes in frame standards.
- Standard 270.01 on application factors for helical and herringbone reducers will be revised to correlate with 150.01 on gearmotor application factors.
- Standard 430.01 on bevel and helical speed reducers is being revised to have uniform ratings for all reductions. New standards are being planned on torque-arm or shaft-mounted units, on thermal ratings and on surface-finish specifications for main propulsion gearing.
- Standard 290.01 on marking for gearmotors will be modified to cover all enclosed drives. Standards are also being developed on spur aircraft gears on zerol bevel gears, spiral bevel gears and on mountings. A new standard is also being developed on coarse-pitch worm gearing, and the progress report on bending stress on automotive gears has been completed. In fine-pitch gearing, a progress report is being developed on right-angle helical gears of 20° PA, another on hole depths and another on gearing design for right-angle helical drives, as well as one on size requirements for fine-pitch gears for various loads. The AGMA nomenclature for gear-tooth wear and failure will be recommended for adoption as an ASA standard.
- Standard 201.01 on thread forms for involute spur gears will be expanded to include 25° PA.
- Pin-measurement standard 231.51 has been revised for the 1.728 series of pins. Formulas are now being added for non-standard wire sizes as well as cautions in their use.
- Standard 234.01 on worms and worm gears will be submitted for adoption, as well as 235.01 on master gears, after extensive revision in the case of the latter. A data sheet is being developed on care and selection of hobs, as well as others on tolerances for gear blanks and gear-rolling tests.

In addition to committee work at the meeting, three papers were presented, one on renegotiation by C G Moates of American Steel Foundries, another on scoring phenomena of gears by Bruce W Kelley of Caterpillar Tractor Co, and a third on economics of machinery replacement by Robert S Collier of the Cincinnati Milling Machine Co.

Offshore Aid Gets Rolling With France Awarded Largest Share

WASHINGTON—The split-up of $730 million in offshore procurement funds for fiscal year 1952 works out this way:

- France—$350 million
- Italy—$140 million
- England—$75 million
- Belgium—$48 million
- Netherlands—$41 million
- Switzerland—$34 million
- Greece—$11 million
- Germany—$10 million

The remainder goes to Denmark, Norway, Sweden, Austria, and Luxembourg.

All of this is under the agreement whereby the US will buy the arms to outfit the NATO forces from European manufacturers. Most defense officials here figure it's the best way to provide the arms and economic aid quickly without increasing the pressure on US manufacturers.

The idea is also to get Europe working on defense materials, then we can step out of the economic-aid picture eventually. It should also reduce our overseas supply lines.

Complete Weapons

Up to now, offshore procurements have been for spare parts, mainly, but we will probably be ordering more complete weapons soon, including planes and tanks.

French aircraft maker Marcel Dassault has an $83-million order for the Mystere jet fighter, which is the first French plane to fly faster than sound. The ship has been checked by US pilots and engineers, and shows promise. The Mark II version (that tested) is powered by a French-built Rolls Royce Tay turbojet with 6500 lb of thrust. A later version—the Mark IV—is being tested, too, and has more power.

Future Buying

The Pentagon, already working on estimates for fiscal 1954, guesses the arms-aid program will run around $6 billion for 1953, with $2 billion of this being held off for a year or more because of the many reviews by US and international committees that are required.

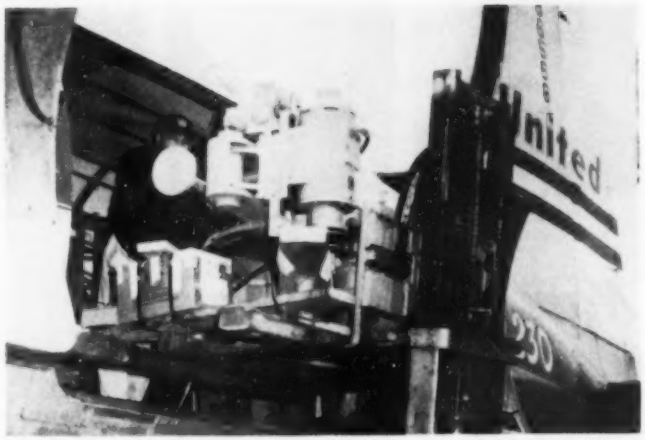
Aircraft orders, which will predominate in the program, are worrying US plane manufacturers. They reason that US aid and the necessary know-how techniques that must be taught the foreign builders will allow offshore manufacturers to produce as well as we do—and cheaper. They can see ahead to reduced US markets for commercial planes, as well as military types like those made by North American and Republic.

Helicopters Going Up

WASHINGTON—The Army has asked for $200 million for the purchase of some 4000 helicopters during the 1953-5 fiscal year.

$20 million is said to be earmarked for development and research, and $180 million for actual production. Previously, helicopter work had been budgeted at no more than $20 million.

The Army request, added to the much larger Navy and Air Force requirements, may place the total budget requests for helicopters for 1953-54 at close to $1 billion.



3700-LB LATHE GOES BY AIR FREIGHT from Chicago to New York. Lathe, built by Milwaukee Shipbuilding Corp, is hoisted into cargo plane by lift truck

Lockheed Building Air Force's First Turboprop Cargo Transport

MARIETTA, Ga.—Factory facilities at Lockheed Aircraft's plant here will be used to turn out the Air Force's new turboprop medium cargo transport C-130A.

The 300-acre installation, a government-owned facility, will handle the job in addition to production of B-47 jet bombers. The plant—world's second largest aircraft factory under one roof—was reactivated two years ago for modification and demothballing of B-29's. Current employee total of 11,500 is expected to reach 15,000 by mid-1954.

Prototypes of the C-130A are now under construction at the company's Burbank factory. The Georgia order, for an undisclosed quantity, covers build-up of assembly lines and tooling for large-scale production.

Driven by four Allison turboprop engines, the C-130A is the first AF cargo plane designed from the outset for turboprop power. Power plant is basically a jet which applies its force to propellers; exhaust jets yield extra thrust.

The plane incorporates truck-bed level loading, integral loading ramp, and pressurized cabins. Cargo floor stands 45 in. from the runway, providing direct loading of vehicles and bulky cargo without special freight-handling devices. Design and performance figures are still secret.

Convair Starts Production of Supersonic Defense Interceptors

SAN DIEGO, Calif—Consolidated Vultee has received an Air Force order for quantity production of the new delta-wing supersonic interceptor, the F-102.

Details of production rate are secret; some idea of the size of the program may be guessed from the fact that F-102 work alone will keep Convair employment in San Diego at a high level for at least two or three years.

Indications are that there would be little new hiring specifically for the fighter plane work this year, but the division's total employment will increase from 20,000 to 23,000 by the end of 1953 as a result of the order.

The contract is Convair's first for large production of a fighter plane. Entry into the new field puts the firm in all facets of airpower production: strategic bombers, guided missiles, commercial transports, trainers, electronics systems, and water-based planes. The company already had a backlog listed at "more than $1 billion."

The plane will be powered by a Pratt-Whitney J-57 jet engine with a 10,000-lb thrust compared with the XF92-A's Allison J-33-A-29 turbojet with 5200-lb dry thrust, including afterburner.

An electronic pilot will be set from the ground to carry the plane directly to within range of a high-flying enemy bomber, once its position is charted by radar. The accompanying pilot's job will be to push the buttons in case the interceptor slips off course, and to see that its guided missiles are fired.

The F-102 is said to be larger than the XF92-A, which had a wingspan of 31 ft, 3 in.; length of 42 ft, 5 in.; height of 17 ft, 8 in. at the tip of the vertical fin, and a takeoff weight of 15,000 lb. The XF92-A was rated as "high subsonic" in speed, with a service ceiling of "over 45,000 ft." The F-102 is well into the supersonic speed range, and reputedly has a service ceiling of "over 60,000 ft."

TEMCO's Demon Contract Grows

DALLAS, Texas—TEMCO Aircraft Corp has received its second prime contract from the Navy for manufacture of a large additional quantity of McDonnell F3H Demon carrier-based jet fighters.

Number of planes ordered and dollar value of the two contracts has not been revealed. Combined backlog of TEMCO and its subsidiary, Luscombe Airplane Corp, reached a new high of $245,600,000 at the end of the 1952 third quarter on Sept 30, compared with $208,000,000 at second quarter end on June 30.

Harry T Kessler

A N Abelson

James T Duffy, Jr

Emery B Kerekes

Names in the News

Harry T Kessler has been named president and treasurer of the Tuthill Pump Co, Chicago. He succeeds **G B Tuthill**, elected chairman of the board. **N G Tuthill** has been appointed vice president and secretary. Mr Kessler has served as executive vice president of the company since 1943.

E D Tull has been named to the newly-created position of vice president and general manager of Cummins Engine Co, Columbus, Ind. A member of the firm since 1928, Mr Tull was named vice president of personnel and plant last February, and was recently elected to the board of directors.

Owen L Taylor has been named manager of engineering for the Bryant Electric Co, Bridgeport, Conn, subsidiary of Westinghouse Electric Corp. Mr Taylor will succeed **E E Forstrom,** who will retire early next year. Mr. Taylor joined the Westinghouse organization in 1939, and has been associated with Bryant since June 1951.

Ferdinand J Stackel has been named executive assistant to the vice president in charge of government contracts of the ACF-Brill Motors Co. Mr Stackel was formerly chief of the Research and Development Branch of the Philadelphia Ordnance District.

Leonard B Allen has been named assistant plant manager of Solar Aircraft Co's San Diego plant. Mr Allen, who joined the company in 1938 has served as chief production engineer, and most recently as manager of quality control.

A N Abelson has been appointed vice president in charge of manufacturing of Aro Equipment Corp, Bryan, Ohio. Formerly general manager of the Cleveland plant, he will now be responsible for all production at both Bryan and Cleveland.

James T Duffy, Jr, has been elected vice president of the Camden Forge Co. Mr Duffy was formerly president of the Riverside Metal Co, from which he resigned in April.

Elmer W Krueger has been appointed vice president of Cleveland Pneumatic Tool Co. A member of the organization since 1922, Mr Krueger has been serving as operations manager since June 1949, and has been a member of the board of directors for the past two years.

Howard J Evans has been named chief engineer of Rockwell Mfg Co's Meter and Valve Div. He will continue as engineering head of Gas Products. **Robert J Sarraf** has been appointed chief chemical engineer for the division.

Dr Wayne H Keller has been appointed director of the National Research Corp Chemistry Dept. Dr Keller will be in charge of the program aimed at the economical reduction of metallic titanium.

Peter R Prunkl has been appointed plant manager, Tube Reducing Corp, Wallington, NJ. Mr Prunkl, who joined the company in 1941, was assigned in 1950-51 as the company's representative to assist Italian tubing products manufacturers in their changeover to American machinery and production techniques.

Emery B Kerekes has been appointed assistant to the vice president of Hydropress, Inc, and its subsidiary, Loewy Construction Co of New York.

R A Vidinghoff, Machinery Associates, Inc, Philadelphia, Pa., was the fourth member of the executive committee of the American Machine Tool Distributors Association. His name was inadvertently left out of our story on the meeting (AM—Oct 13, '52, p 187).

Joseph E Kruse has joined the machine tool sales force at Strong, Carlisle & Hammond Co, Cleveland. Mr Kruse formerly headed the industrial engineering department, Container Corp of America, Cleveland Div.

Charles W Baker has been appointed western regional manager for Chase Brass & Copper Co. Formerly Milwaukee district manager, Mr Baker will supervise sales operations in eleven western states, with headquarters in Los Angeles. **Charles A Festge,** named to succeed Mr Baker, will also serve as supervisor of warehouse operations in Milwaukee.

J Roy Knox has been elected vice president, US Div sales, US Radiator Corp; he has been serving as general sales manager of the division for the past three years. **E J Grady** has been named vice president, Pacific Boiler Div sales; he moves up from his post as general sales manager of the division.

Marcus M Chapman has been named assistant general manager of sales, distribution, US Steel Co. **James P Barton** succeeds Mr Chapman as manager of sheet and strip sales.

Fred L Plummer

Ralph J Furstoss

Joseph S Imirie

Howard E Earl

American Welding Society has elected **Fred L Plummer,** director of engineering, Hammond Iron Works, as its president for 1952-53. **Eric R Seabloom,** supervisor of field engineering, Crane Co, Chicago, has been named first vice president, and **J H Humberstone,** vice president of Air Reduction Co, has been elected second vice president.

Douglas R G Williams has been made staff assistant, Mfg Div, Arma Corp. Mr Williams was formerly associated with Behr-Manning Corp as assistant to the vice president in charge of engineering and manufacturing.

James M Mead has been appointed first assistant to the vice president in charge of purchasing, procurement, and merchandising of Joseph T Ryerson & Son. Mr Mead, a member of the firm since 1919, was formerly manager of the New York plant. **William O Springer,** Cleveland plant manager since 1945, will take over Mr Mead's post in New York. **William K Underhill,** sales manager of the NY plant for the past eight years, has been appointed assistant plant manager.

John L Young, vice president in charge of engineering for US Steel Co, has been elected president of the Association of Iron and Steel Engineers for 1953. **E L Anderson,** Bethlehem Steel, and **John H Vohr,** US Steel's Gary works, were elected vice presidents.

Lyndon B Burnham has been appointed general sales manager of Worcester Pressed Steel Co, Worcester, Mass, replacing **Owen H Wenning,** resigned. Mr Burnham was formerly vice president of Roland Teiner Co, Everett, Mass.

Ralph J Furstoss has been appointed assistant director of research for Caterpillar Tractor Co. Mr Furstoss joined the firm in 1934; prior to his new assignment, he served as supervisor of field engineering. **V Z Pavlenko** has been named assistant export divisional manager in administration of sales activities in Africa, India, Pakistan, and the Middle East.

Joseph S Imirie has been appointed to the newly-created post of assistant to the president of the Carborundum Co, Niagara Falls, NY. Mr Imirie has been a member of the organization since January of this year, investigating new products to be added to the company's present line.

John E Pearson has been appointed manager of the Massillon plant of Ekco Products Co of Chicago. Mr Pearson moves up from his post as general supt to take over the duties of William J Gazey, now vice president in charge of manufacturing for the Ohio area.

Walter I Buchanan has been appointed eastern industrial sales manager of National Motor Bearing Co; he will make his headquarters in the company's Detroit office. Prior to his appointment, Mr. Buchanan was division sales manager for the Spicer Mfg Co, Toledo.

John J McDermott has been appointed sales engineer for Gries Reproducer Corp in the metropolitan area of New York and New Jersey.

Hayward F York has been named factory manager of the Chrysler Detroit Tank plant, and **Roman Andrysiak,** recently appointed supt of assembly, has been promoted to assistant general supt under Mr York.

Howard E Earl has joined the Sundstrand Machine Tool Co, Rockford, Ill., as chief engineer in charge of development of the company's pneumatic and magnetic products. Mr Earl was formerly with the Eureka Williams Corp, where he was director of research, and prior to that, chief engineer of the Williams Div. **George Seeburg,** formerly sales engineer, has been appointed assistant general manager of the machine tool division. **T B Buell** has been named general sales manager in charge of overall policies; **Harry Leber** succeeds Mr Buell as sales manager.

Andrew L Pontius has been named works manager of the Shakeproof Div, Illinois Tool Works, Chicago. Prior to his appointment, Mr Pontius was director of manufacturing for A B Dick Co.

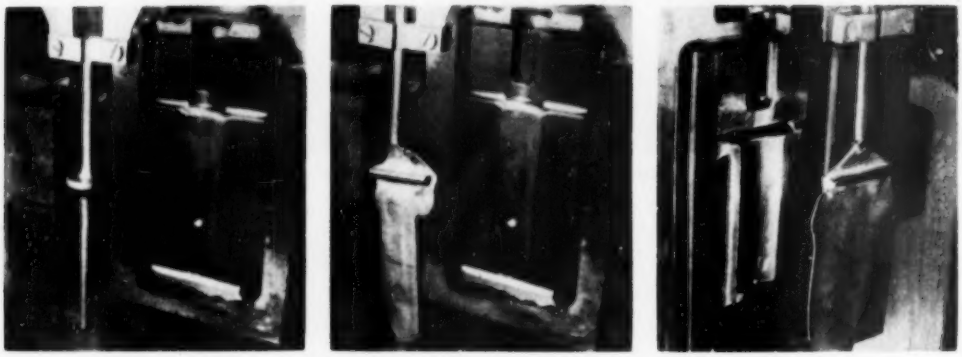
OBITUARIES

Fred H Haggerson, 68, chairman of the board of Union Carbide & Carbon Corp, died Oct 14 in New York. Mr Haggerson, associated with the organization for 33 years, was appointed vice president in 1938, director in 1941, president and a member of the executive committee in 1944, and had been serving as board chairman for the past year.

John T Robbins, 50, metallurgist and sales engineer of Peter A Frasse & Co, New York, died Oct 18.

James E Loshbough, 81, founder and former president of Federal Press Co, Elkhart, Ind, died Oct 10 in Elkhart. In 1914 Mr Loshbough founded the L&J Press Co, and in 1925 withdrew to found Federal, which he headed until last year.

New Shop Equipment



Stainless-steel stock that has been induction heated is suspended between dies (left) and struck from each side (center), then advanced to position for second and final blow (right) to produce jet blades to finished tolerances

Chambersburg Impacter Forges in Mid-Air

A fundamentally new method of working metal—actually forging in mid-air with work struck from opposite sides by a pair of dies—has been developed by the Chambersburg Engineering Co. Christened "impacting," the process is performed in the new Cecomatic Impacter.

The basic principle of the Impacter is demonstrated by the old stunt, so dear to teachers of physics, of releasing two balls of equal size, suspended by strings from a common point, so that they strike head on at equal velocity. The balls stop dead—they do not rebound. The law of physics thus demonstrated is that when two inelastic bodies of equal mass traveling at like speeds collide, both bodies come to rest with a complete absorption of energy.

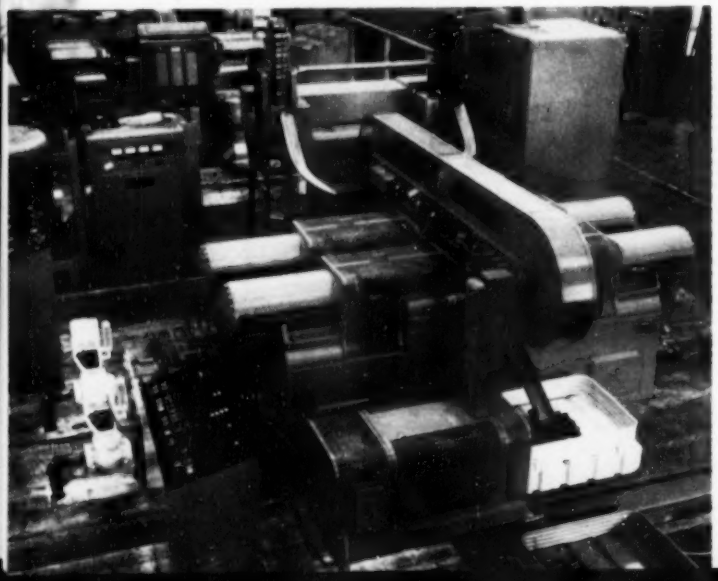
In the Impacter the two bodies are called impellers. Each carries one die on its face and is actuated by compressed air. Metered shots of air send the impellers together at exactly equal (and controllable) speeds. If the stock is now suspended in the plane of die contact, all the energy contained in the advancing impellers will be absorbed by the work.

Thus external shock and vibration are eliminated. There is no discernible vibration of the machine or the floor while the Impacter is in operation.

In addition, because the metal is worked from both sides rather than from one, the amount of metal movement required is less. In forging a sphere to a disk, for example, 23% less energy is required when the point of zero velocity is the center of the sphere (as in impacting), rather than at a point on the surface (as in conventional flat die forging).

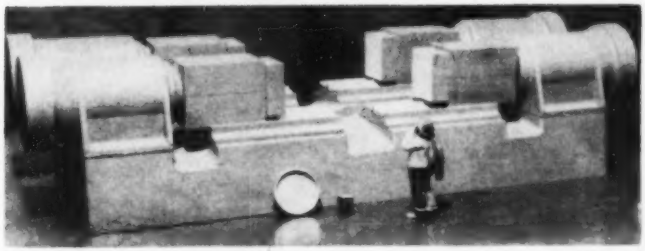
Stock must be held mechanically which insures exact, repetitive positioning in relation to the dies. Thus impacting lends itself to automatic feeding devices, but there is no reason why, for limited production, an impacter could not be equipped with a simple holding device in which the operator would place heated stock.

Present machines are all equipped for automatic handling, with one



Two No. 6 Impacters with Cecomatic feed device and Tocco induction-heating units provide automatic setup for forging jet blades shown at top of page. Controls are concentrated in console; other console (left rear)

Materials and Parts



Impacters suitable for forging jet-turbine disks would be this size

blow struck by the Impacter with simple insert dies mounted in holding blocks on the impellers. When two blows are required, two Impacters have been installed side by side (one for blocking and one for finishing). There is no reason, however, that blocking and finishing impressions could not be incorporated in one set of dies and stock positioned for successive blows in the same Impacter as it now is in the tandem arrangement.

The accurate control required is handled electronically with all controls centered in a console. Rough adjustment of blow pressure is obtained by varying the air pressure and fine adjustment by varying the time of valve opening.

In addition to blow intensity, the number of blows per time interval, the spraying of dies, and the stock handling procedure can all be preset. The control mechanism automatically corrects for any variation that develops in speed or position of impellers. A blow will not strike unless stock is properly positioned in the plane of contact and the Impacter can be equipped with Leeds & Northrup control to reject work not at the proper temperature.

Impeller action is fast. The exact duration of die contact with the work is not yet known beyond the fact that it is less than 1/3000 sec. Dies thus run cooler than in either conventional hammer or press forging. Because of vertical positioning, die lubrication does not accumulate in either die.

First installation of an Impacter (No. 6 size) is at the International Silver Co. for cold forging of knife handles. This operation is described in the article on page 126. A No. 6 is also being used for cold coining of jet blades at Thompson Products.

The unit illustrated is for Packard, and is one of several that will forge jet blades in several sizes for the J47. The Air Force has restricted production data on jet blades, but it is known that where one trim press served two hammers, four to six trim presses will be required for each Impacter installation.

Oldsmobile is also receiving two No. 6 units for rough forging blades for the Sapphire J65 engine.

Fast, automatic heating is required for such production rates. Either induction heating or radiant gas can be engineered to meet the requirements and the elimination of vibration makes the use of delicate controls feasible.

Ratings of sizes represent the energy in thousands of foot pounds per blow. Chambersburg states that the economic use of a given machine will be from its rating to about 60% of its rating. Engineering has been completed on sizes 4, 6, 10, 15, 25, 40, 65, 100, 150, 250, and 400. Larger sizes would be possible. If, for example, the limit on the weight of an impeller is 400,000 lb, an Impacter rated at 3,000,000 ft lb would be practical. Of course, many related problems that will arise in the larger sizes need to be dealt with and Chambersburg, now building No. 15's, hopes the Air Force will let them work up in size gradually.

Because the process is so basically different from any existing method there is much to be learned before the full implications of impacting can be understood. Already, for example, it has been found that the work does not take the exact form of the dies. The speed of blow is so

... INCLUDING

Hob- and worm-lead checker is also able to check hob pressure angle with an auxiliary fixture .....page 196

ODs are ground concentric to bores to extra-close tolerances on automatic grinder .....page 197

Automatic hardfacing process uses a vibratory unit to feed bulk tungsten-carbide particles .....page 197

Cylindrical grinder is able to handle large-dia work such as jet-engine rotors .....page 198

Multiple-ram assembly press automatically inspects the work by means of red and green indicator lights .....page 202

Hydraulic copying attachment has all hydraulic parts integral with the casting .....page 204

Automatic flash lathe with ten spindles performs various finishing operations on small metal parts .....page 206

Endless-belt filter uses same filtering material over and over, handles up to 1000 gpm ....page 210

... and in Nov. 24

X-ray machine weighs only 150 lb as opposed to previous 1150, yet has same capacity

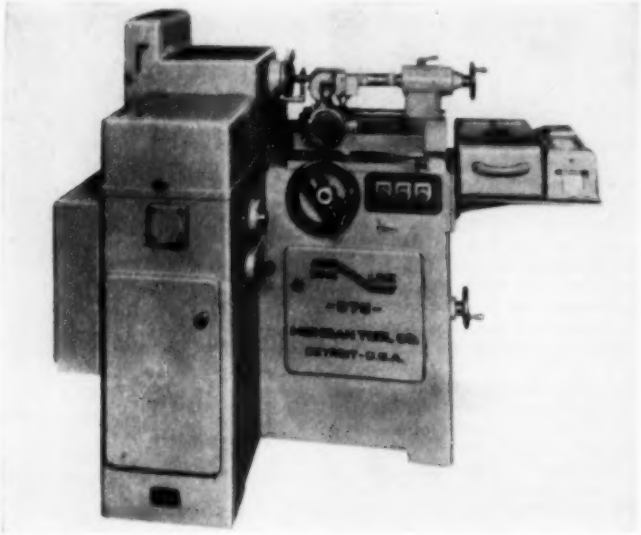
Hollow-spindle lathe with 42-in. swing machines turbine-frame assemblies for jet engines

great that the stock continues to move under its own inertia after the dies have departed. This will require much development work in die design. It has also been found that thickness tolerances can be controlled to a degree by varying blow intensity.

The potential larger sizes of the Impacter pose heating problems unlike any met before. Several companies are working on heating methods that may solve these problems.

A basic research program has been undertaken at Penn State on die design, plastic flow, and related subjects. A No. 4 Impacter is being used for part of this research and a special laboratory setup for impacting laminated wax stock for other phases of the work.

Chambersburg Engineering Co., Chambersburg, Pa.



Hob- and Worm-Lead Checker is Hand or Motor Driven

Hob capacity	¼ to 8 in. dia
Max. spread of center	13 in.
Lead capacity, (right or left)	0 to 7.2 in.
Motor	¾ hp. 1800rpm

In addition to inspecting leads on hobs and worms, the Model 876 will check flute and thread spacing on multiple-thread hobs. An auxiliary fixture can be mounted in place of the indicator head to check hob pressure angle.

The lead checker can be hand operated or motor driven. Automatic recording equipment can be provided to work in conjunction with it.

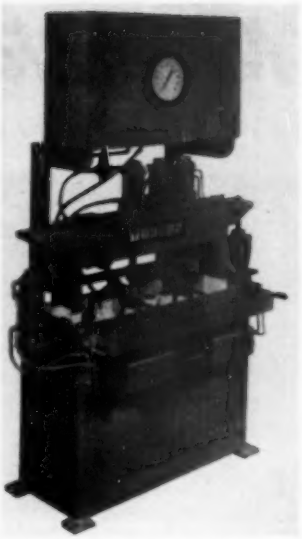
In checking leads, the rotation of the hob or worm spindle and translation of the indicator table parallel to the hob spindle is effected by a sine-bar table on the machine base. A master rack mounted on the sine-bar table engages a pinion that drives the hob spindle through hardened and ground master change gears. The indicator table, which is mounted on hardened and ground ball ways, is held against the sine bar with constant pressure.

The machine is set up to check a given lead by selecting change gears according to a table included with a formula sheet, and calculating the correct sine-bar setting. Deviations from true lead are shown in tenths.

Index plates are used to check hob flute and thread spacing. Two table drives are provided. An indicator or table rapid-return mechanism speeds checking.

The unit has a hob capacity of from ¼ to 8 in. dia.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12 Mich.



Manifolds are loaded into a test fixture where the casting is sealed in three planes. Air-pressure loss detects faulty casting

Pressure Testing Unit Locates Leaks in Castings

A pressure testing machine has been designed for detecting and locating leaks in gas passages in cast-iron automotive-engine exhaust manifolds by the use of air pressure and an illuminated water tank.

Manifolds are manually loaded into the test area of the machine where exhaust gas areas are sealed in three planes by rubber-faced, air-cylinder-controlled sealing pads. When pads contact the manifold, resulting pressure buildup in the control circuit initiates an automatic air test cycle. Manifold is then charged with a specific volume of air trapped in gas areas.

Pressure loss over a given preset test time is indicated by a gage in the head of the machine. Leaks in manifolds showing excessive pressure loss are located by immersing the head in a built-in illuminated water tank, finished with special paint to provide maximum light reflection to the part. After being raised from immersion tank by air-cylinder controls, manifold can be marked with chalk to indicate areas for impregnating with adequate material to pass pressure test specifications.

Machine measures 80 in. high, 60 in. wide, and 30 in. deep.

Modern Industrial Engrg Co, 14250 Birwood, Detroit 4, Mich.

Grind OD Concentric to Bore With Landis Automatic Grinder

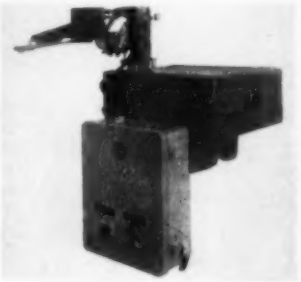
Work such as anti-friction bearing races or rings for precision mechanisms can now be OD ground within extra-close limits for concentricity. This is possible because of a new method of work holding in the Landis 4-in. concentric grinder. Time required is no more than is ordinarily needed to grind parts to commercial tolerances. When grinding grooves or raceways, parallelism with the face is assured to close limits.

The work revolves about an arbor which has two wear-resistant strips set in it lengthwise. In operation, the arbor is moved to a position aside of, and near the center of the revolving permanent-magnet face plate. The two strips are spaced above and below the horizontal center line on the side of the bore nearest the grinding wheel. In effect, an internal V-support is provided.

An automatic loader is available which loads and unloads the work arbor, and also moves it into and away from grinding position. Hand- or power-operated wheel dressers, either straight or profile, are also available. The cycle is automatic so that it is possible for one operator to maintain a battery of machines.

The 16-in.-dia grinding wheel is driven from a 3-hp motor. Landis Microsphere spindle bearings are used in both the wheel and work head. Hydraulic rapid infeed and continuous hydraulic slow grinding feed are used to position and feed the wheel during the grinding cycle.

Landis Tool Co, Waynesboro, Pa.



V & O Mechanical Feeder For Punch Presses, Other Operations

A redesigned version of a mechanical punch-press feeder broadens the application of the unit in secondary die work and permits its use for parts transfer operations not connected with presses.

The original model, Feed-O-Matic F-1, is used to feed relatively large parts into the die of a press for secondary operations. The operator places the part into a nest, and a transfer arm picks the part out of the nest and places it into the die.

The F-3 is equipped so that the pick-up can be timed to coincide with the completion of a production operation, or with the arrival of the part at a pre-determined location. The timing of the press stroke is controlled by the feed unit.

The F-3 provides direct vacuum pick-up for flat parts, vacuum-controlled grip fingers for pieces that have different planes, and in special applications, a magnetic pick-up.

V & O Press Co, Div Emhart Mfg Co, Hudson, N Y.

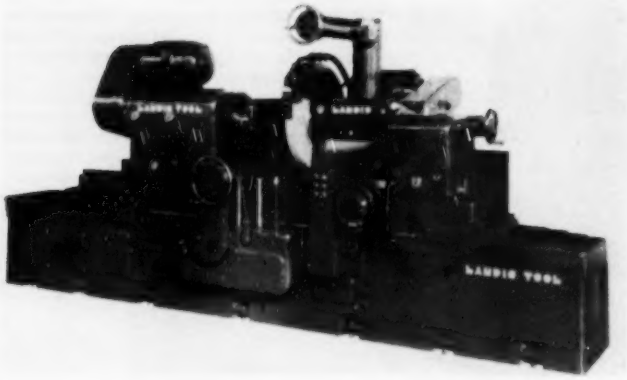
Automatic Hardfacing Process Feeds Bulk Tungsten Carbide

This process uses a standard automatic Heliweld head and a unit for feeding bulk tungsten carbide. By depositing loose, granular tungsten-carbide particles, reduction of particle size by solution of the carbide into the base metal is minimized. It also minimizes heat-affected area adjacent to the deposit.

The arc melts the base metal, producing an elongated pool. The carbide particles are poured into this pool behind the arc. The rate of particle feed from the vibratory hopper mounted on the head is electrically controlled to high accuracy.

Tests are said to have shown abrasion resistance of deposits that is greater than that with other arc methods.

Air Reduction Co, 60 E 42nd St, New York 17, N Y.



Landis Plain Grinder for Large-Dia Work

Previous to the development of this line, large-dia pieces were ground on standard machines with raised centers, or heavy-duty machines that would accommodate these sizes. The CHW has bridged this gap to provide a cylindrical grinder of the correct size. Parts such as turbo-jet-engine rotors, track carriers, large-dia motor armatures, water valves, and similar parts of large diameter, or with projections, can be handled. It is available in 30-, 36-, and 48-in.-dia swings. Lengths between centers are 48, 72, 96, and 120 in.

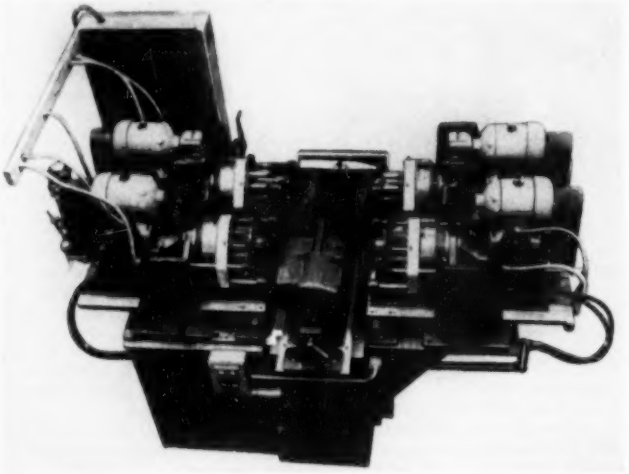
A 10- or 15-hp motor is used to drive the 30-in.-dia grinding wheel. Variable-speed headstock drive is standard, but constant speed is available.

The slide under the wheel head is a double type to allow for the large amount of base movement required. This slide is manually positioned, but can be equipped for power operation. The slide and carriage ways are pressure lubricated from a separate reservoir.

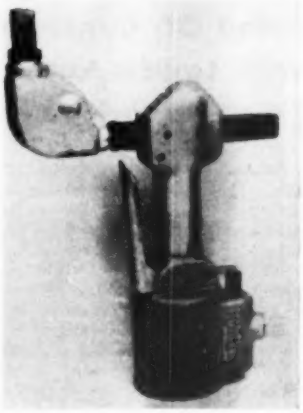
Carriage ways have increased spacing to provide stability when grinding large-dia work. The hydraulic table traverse is adjustable to any desired speed between 3 and 130 ipm. The swivel table may be adjusted for tapered work.

Eye-level wheel feed enables the operator to watch the grinding from the same position from which he adjusts the wheel. The wheel spindle runs in Landis Microsphere bearings which may be quickly and easily adjusted for clearance.

Landis Tool Co., Waynesboro, Pa.



TWO-STATION DRILLER and tapper machines six power take-off holes on each side of seven different transmission cases. The whole pattern is essentially the same on all cases, but the relative positions of the holes are different. Therefore, the machine is designed with angular side, and vertical adjustments to accommodate the different hole positions. It consists of four hydraulic feeding units and four gearless drillheads. The first station has two opposed drillheads which drill six holes each in both sides of the case. A transfer unit then moves the case to the tapping station. Upon completion of the tapping, the transfer unit returns the work to unload position. The cycle is completely automatic. — *Zagar Tool Inc, 24000 Lakeland Blvd, Cleveland 23, Ohio*

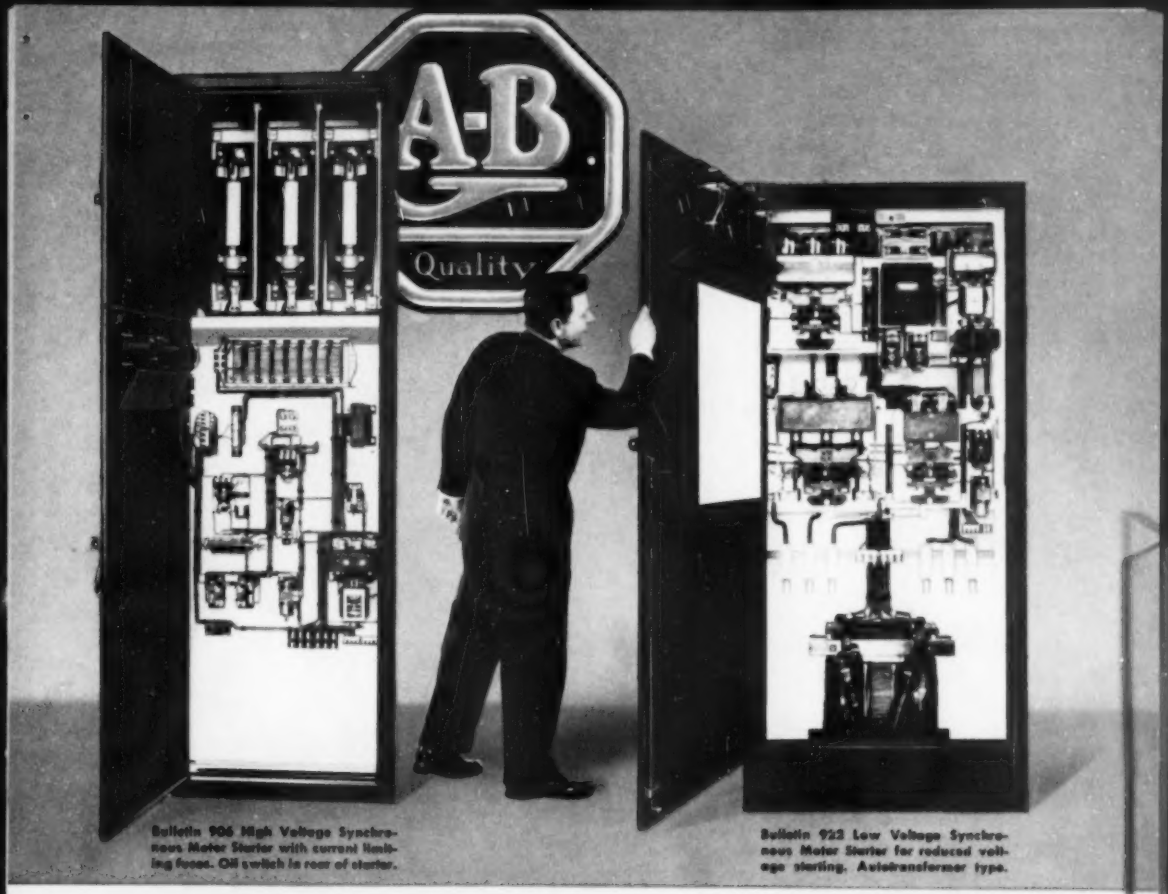


Huck Angle Adapter Simplifies Blind Riveting

This angle adapter, when used in conjunction with either a Huck hand or air riveting tool, simplifies assembly of deep channels, hard-to-reach corners, and otherwise impossible-to-rivet locations.

One person from one side of work can now drive 1/8-, 5/32-, and 3/16-in.-dia self-plugging, or pull-through blind rivets in a clearance space of only 4 in. from the nose of the riveting tool to the back face of the angle adapter. The adapter fits into a Huck No. 93 air riveting tool or a No. 94 hand tool.

Huck Mfg Co, 2480 Bellevue Ave, Detroit 7, Mich



Bulletin 906 High Voltage Synchronous Motor Starter with current limiting fuses. Oil switch in rear of starter.

Bulletin 922 Low Voltage Synchronous Motor Starter for reduced voltage starting. Autotransformer type.

STARTERS FOR BIG MOTORS

Bulletin Number	Type of Motor	Operation	Maximum Horsepower 208-220v	440-550v	2000-2500v	2501-4600v
646	Sq. Cage	Manual	125	250	—	—
726	" "	Automatic	—	—	700	700
740	" "	"	300	600	—	—
741	" "	"	300	600	—	—
742	" "	"	300	600	—	—
746	" "	"	300	600	—	—
747	" "	"	—	—	700	700
904	Synchr.	Manual	125	250	—	—
906	"	Automatic	350*	700*	900*	900
914	"	"	250*	250*	—	—
922	"	"	350*	700*	900*	900

(*) At 100% power factor

● The motor starters, shown above, are examples of the many big units in the Allen-Bradley line.

Various types of manual or automatic starters for synchronous motors are available . . . up to 900 hp., 220 to 4600 volts.

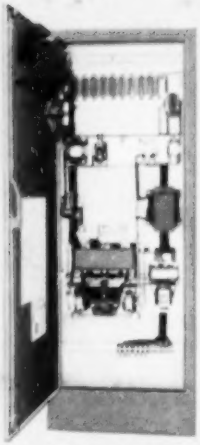
High voltage squirrel cage automatic motor starters are listed up to 700 hp., 2000 to 4600 volts. Relays and contactors are time-tested A-B designs, fully protected when specified, by current limiting fuses.

The A-B Handy Catalog is a convenient manual on motor controls . . . large or small. Write for it, today!

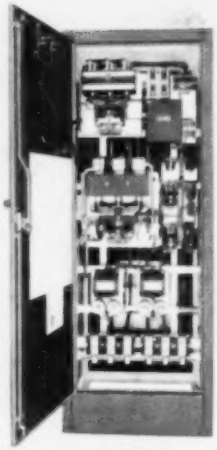
Allen-Bradley Co., 1316 S. Second St.,
Milwaukee 4, Wis.

B-52—MR

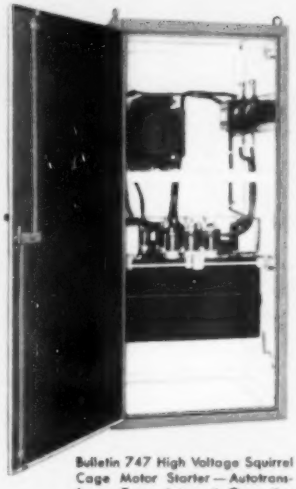
A-B
ALLEN-BRADLEY
QUALITY
MOTOR CONTROL



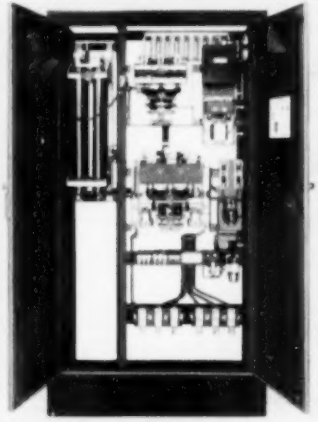
Bulletin 906 Low Voltage Synchronous Motor Starter—Full Voltage Type—Automatic Operation



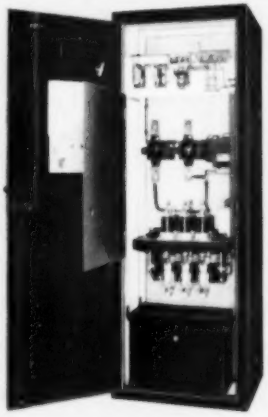
Bulletin 742 Low Voltage Squirrel Cage Motor Starter—Stepless Resistance Type—Automatic



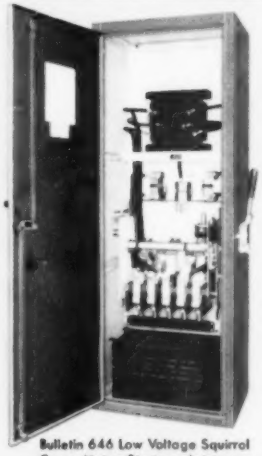
Bulletin 747 High Voltage Squirrel Cage Motor Starter—Autotransformer Type—Automatic Operation



Bulletin 914 Low Voltage Synchronous Motor Starter—Resistance Type—Automatic Operation



Bulletin 726 High Voltage Squirrel Cage Motor Starter—Full Voltage Type—Automatic Operation



Bulletin 646 Low Voltage Squirrel Cage Motor Starter—Autotransformer Type—Manual Operation

Starters for Large High and Low Voltage Motors

The high quality of design and construction, which has made the Allen-Bradley line a leader among motor starters, is built into Allen-Bradley starters for big motors, too.

These big starters can be supplied with all standard accessories, such as contactors for controlling auxiliary equipment, meters and instruments, current limiting fuses, etc. At maximum rating, these starters have an interrupting capacity of 10 times motor full load current.

Standard features of A-B synchronous starters include polarized field frequency relay, automatic resynchronization, thermal overload relays, out-of-step relay, and undervoltage protection. Reduced voltage starting is available either with resistor or autotransformer control.

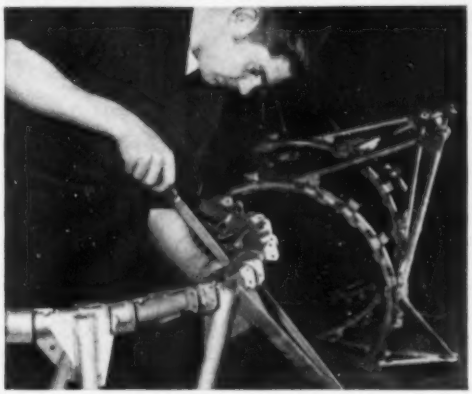
Standard features of the big A-B squirrel cage motor starters include overload relays. Current limiting fuses are recommended for all high voltage starters.

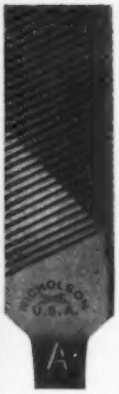
ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

A-B
Quality

Allen-Bradley Company
1316 S. Second Street
Milwaukee 4, Wis.

8-52—MR





(Above)—B-47 jet bombers being assembled at the Boeing Airplane Company's Wichita plant.

(Right)—A filing operation on an aluminum-alloy structural part for a Boeing plane (Seattle plant).

(Far Right)—Nicholson Special Purpose Aluminum "A" File, designed for fast metal removal and yet leaving a good finish. Special tooth construction minimizes clogging . . . deep "open-throat" upcut for good bite, fine overcut for breaking up filings and overcoming "chatter."

BOEING SPEEDS PRODUCTION

with "The right file for the job"

The vast military program has made "Faster production" a cry in every contributing industry . . . with thousands of tools and machines claiming the ability to respond. In few manual operations can speed and efficiency be more noticeably increased than in filing. And where Nicholson Special Purpose Files are recommended and used, the results are usually outstanding.

Here "Special Purpose" means special design for *special facility* in working on specific jobs and materials. Practical file engineering and exhaustive laboratory and shop tests have eliminated all "ifs" and "buts."

Nicholson is pre-eminent in file designing and manufacturing — *exclusively*. You'll do well in letting a technically-minded Nicholson industrial distributor or field engineer help your parts-production and assembly-line superintendents in assigning the right files to their difficult, unusual and mass-production filing jobs.

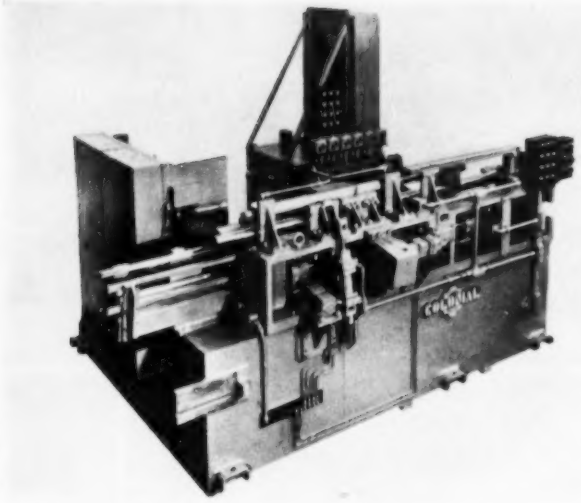
Sold through Industrial Distributors

FREE TECHNICAL BULLETIN on "TEN SPECIAL FILE TYPES." Also 48-page handbook, "FILE FILOSOPHY," on kinds, use and care of files. Write to the factory.

NICHOLSON FILE CO. • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND

(In Canada, Port Hope, Ont.)

NICHOLSON FILES *FOR EVERY PURPOSE*



Multiple-Ram Assembly Press Automatically Inspects Work

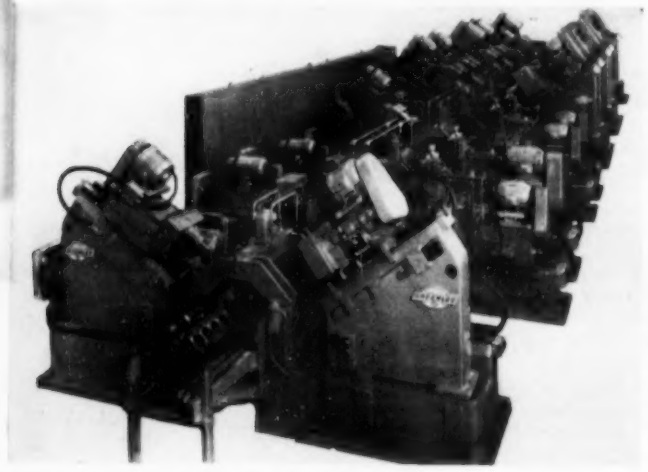
This press is designed to operate in a fully automatic transfer line for assembly of a maximum of 420 valve guides per hr in an automobile engine head. Automatic inspection of press-fit assemblies is provided by a panel of red and green indicator lights. The lights show whether the press fit of each part is too loose, satisfactory, or too tight.

Several other operations besides assembly are performed. Heads are picked up at the loading station and pulled into the second station by transfer bar. Diamond-tipped locating pins are inserted into previously drilled and reamed work holes at each end of the casting, and the valve guide holes are brushed free of dirt and chips and lubricated. At the same time part numbers are stamped on the top of the head.

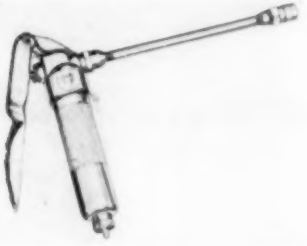
The head then moves to the assembly station where locating pins again engage the part. Rams pick up six valve guides from a gravity-feed hopper and press them in place with 400-psi hydraulic pressure. After insertion of the guides, the heads are pushed out between guide rails to the unloading station.

Rams and other moving parts are behind the machine for safety, and a large red emergency stop button is provided on the control panel. Limit switches on each ram automatically stop the machine if any part is too large for pressing, thus eliminating parts breakage and preventing damage to the machine or fixtures. A limit switch at the unload station prevents operation until the station is clear, preventing jamming of completed parts.

Colonial Broach Co, P O Box 37, Harper Station, Detroit 13, Mich.



AUTOMATIC TRANSFER MACHINE with 18 stations processes V automotive cylinder blocks. It performs 110 machining operations in 38.3 seconds. Drilling, reaming, boring, counterboring, and core-drilling operations are performed in machining the banks, sides, and starter mounting pad of the blocks. A turn-over fixture at the first station raises the block, rotates it 180°, and deposits it pan-rail down, in which position it remains throughout the machining. Another turn-over fixture in the seventh station raises the work and rotates it 360° to remove the chips accumulated inside the block. Four of the 18 stations are idle, provided for inspection and removal of the work. — *Greenlee Bros & Co, Rockford, Ill.*



High-Pressure Lubricating Gun

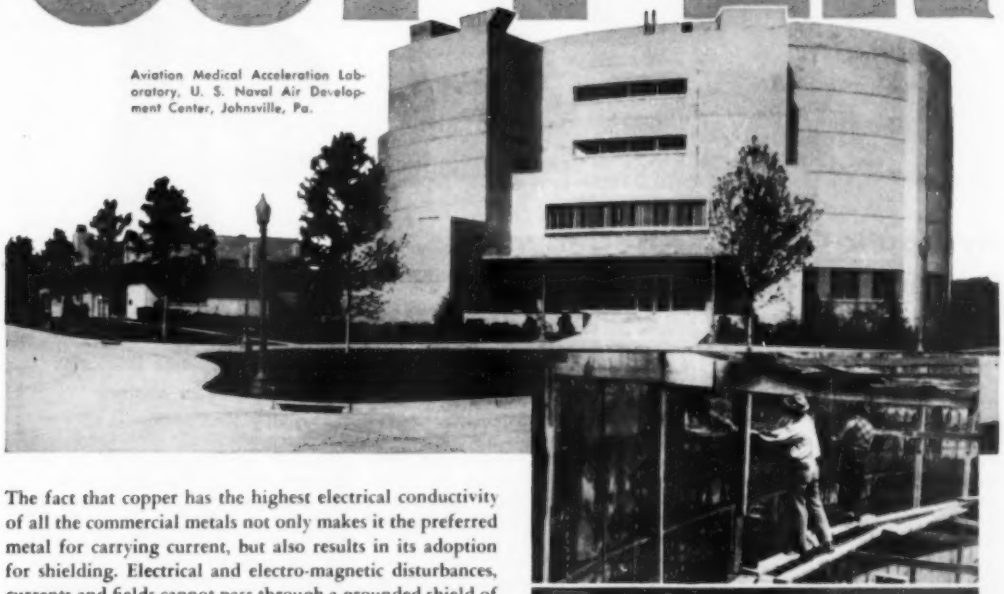
This 2-lb automatic booster gun is designed for lubrication of bearings requiring injection of a small quantity at extremely high pressure, or of limited quantities of special-purpose lubricants. It can also be used for cracking frozen or clogged bearings without use of power-operated gun.

Unit provides complete range of pressures up to 10,000 psi; long hydraulic coupler extension permits reaching deep-seated fittings. The gun, which holds 2½ oz, can be cleaned by removing only one outlet check.

Lincoln Engrg Co, 5754 Natural Bridge Ave, St Louis 20, Mo

COPPER

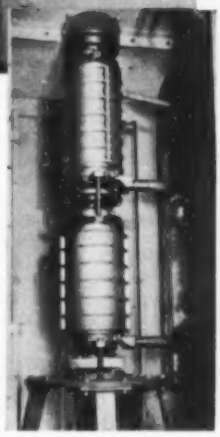
can insulate as well as conduct!



Aviation Medical Acceleration Laboratory, U. S. Naval Air Development Center, Johnsville, Pa.

The fact that copper has the highest electrical conductivity of all the commercial metals not only makes it the preferred metal for carrying current, but also results in its adoption for shielding. Electrical and electro-magnetic disturbances, currents and fields cannot pass through a grounded shield of copper sheet. In this sense, then, copper becomes an insulator. It is widely used for this purpose in laboratories, to assure the accuracy of delicate instruments. A recent spectacular example of such an application is in the Aviation Medical Acceleration Laboratory of the U. S. Naval Air Development Center, Johnsville, Pa. The purpose of the Centrifuge is to test the tolerances of men and animals to the types of acceleration and deceleration produced in military aircraft and to study the physiological conditions which set limits to such tolerances. Recording instruments attached to the subjects are extremely sensitive, but thorough shielding by sheet copper makes it possible to record brain waves without amplification . . . Revere will gladly collaborate with you on scientific and industrial applications of copper and its alloys, and aluminum alloys. See the nearest Revere Sales Office.

Revere Sheet Copper shielding being installed on wall of the Centrifuge chamber by The Howard P. Foley Co., Electrical Contractor, 1630 Pine St., Philadelphia 3, Pa.



A view of the human centrifuge itself. This can produce positive, negative or transverse "G", through accelerations up to 40 times the force of gravity. A great many records are made of each test, including X-ray motion pictures. The subject is observed continually by television.

Upper slip-ring stack—physiological, signal and power. Here copper serves as a conductor.

Official Photographs from U. S. Navy

REVERE

COPPER AND BRASS INCORPORATED

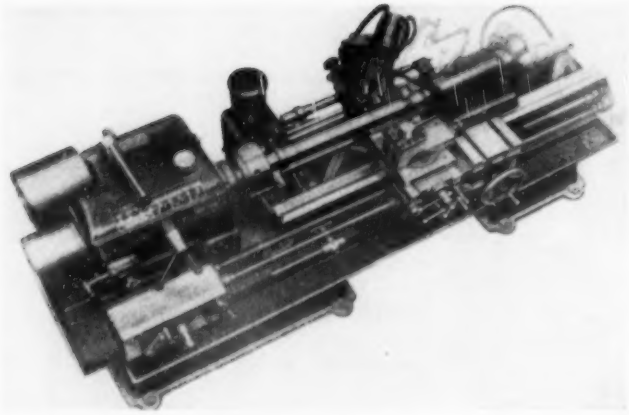
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



Hydraulic Copying Attachment For Most Standard Lathes

Hydraulic copying attachment for application to standard lathes consists of three parts: the copying slide assembly which mounts on the rear of the cross-slide; a templet or circular master carried on a holder at the rear of the bed, and a pump unit. Where there is space left on the normal cross-slide to take a real toolpost, the hydraulic slide assembly can be readily fitted. With a shorter cross-slide which is not provided with T-slots, it is often possible to drill and tap the necessary holes. Where the existing cross-slide is too short, a slide of sufficient length to accommodate the attachment and the normal front toolpost can be made. The lathe can be used for all normal operations without the need for dismantling the attachment. The templet holder can be supplied in lengths of 16, 40, 60, 80, and 100 in.

The gear pump supplying the hydraulic power for holding the tracer finger in contact with the templet and for moving the cutter tool is driven by a ¾-hp motor and operates at 150 to 175 psi. The pump unit includes pump, oil reservoir, electric motor, and switch gear, and usually mounts on its own base plate on the floor. Oil from the pump is taken by flexible metallic hose to the slide of the copying unit and by a plastic hose to the tracer finger, and is returned to the pump through another plastic hose.

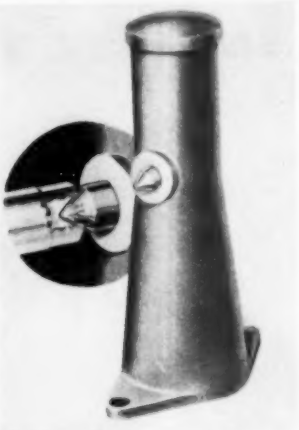
In the tracing unit all hydraulic parts are integral with the casing so that there is no possibility of leakage or loss of pressure. The oil taken to the tracer finger serves to hold it in light contact with the surface of the templet. Between the pump and the double-acting piston controlling the copying slide, there is a valve system controlled by the tracer finger, which is so arranged as to cause the slide to move in conformity with the tip of the finger.

The 45° angle of the copying slide permits 90° shoulders to be turned at the tailstock side of the work and 20° tapers at the headstock side, using the normal feed motion for the saddle traverse. Where very accurate work is required, it is recommended that all work be roughed out leaving 0.010 in. on dia for finishing. Roughing can be performed by using the normal transverse handwheel of the cross-slide, the tool being set so that the handwheel scale reads zero when the final turning allowance is still left on the work. This allowance is removed by a special fine adjustment handwheel at the rear of the attachment.

In addition to tool movements from the cross-slide, there is a quick hydraulic feed in each direction which is controlled by a small level mounted on the front of the cross-slide within easy reach of the operator. It is coupled to the copying attachment by two Bowden cables. When this feed is in use, the limit of travel of the tool in the forward direction is again determined by contact of the tracer finger with the master.

The attachment can be used to cut all profiles with a maximum diameter not exceeding the minimum diameter by more than 6 in. The only other stipulation is that the main driving motor of the lathe should not exceed 12 hp.

Marton Equipment, Inc, 4 Essex St, Beverly, Mass.



Permanent Dispenser Lubricates Lathe and Grinder Centers

The center-lobe dispenser is a sealed unit, mounted on work bench or machine, for lubricating lathe or grinder centers. A pin-hole channel down the center of the dispenser connects directly to the lubricant storage well; firmly-anchored center will depress and release lubricant in a single movement as operator places added pressure on work or mandrel, while holding work with both hands.

Lubricant is sealed in and flushes outward, keeping center free from borings and chips often present with white lead. Slight pressure against the dispenser readies a job for operation in less than 50% of the time necessary when using ordinary methods of lubrication.

H K Tool Co, Waukesha, Wis

High-temperature brazing of molybdenum and tungsten electronic components is being done with a powder that melts at a temperature of 3450 F and forms a continuous, strong braze upon solidifying. Known as Mobraze, it can be used to join molybdenum to molybdenum, tungsten to tungsten, and molybdenum to tungsten. It will not volatilize at use temperatures, whether in hydrogen or extreme vacuum. Test for 1000 hours and longer in 10^{-5} mm of mercury vacuum have not produced any poisoning of the vacuum. The powder is available in 1-, 3- and 6-oz packages.

American Electro Metal Corp., Yonkers, N. Y.

If...the average Lyon Steel Equipment Dealer dressed to represent every kind of customer he serves—he'd be wearing quite an outfit!

for Lyon makes over 1500 different items—serving hundreds of markets including factories, shops, offices, warehouses, schools, churches, hospitals, clubs, institutions and homes.* (A very few typical Lyon Products are shown below.)

**Facilities also available for special contract work*

FACTORIES IN . . . AURORA, ILL., AND YORK, PA.

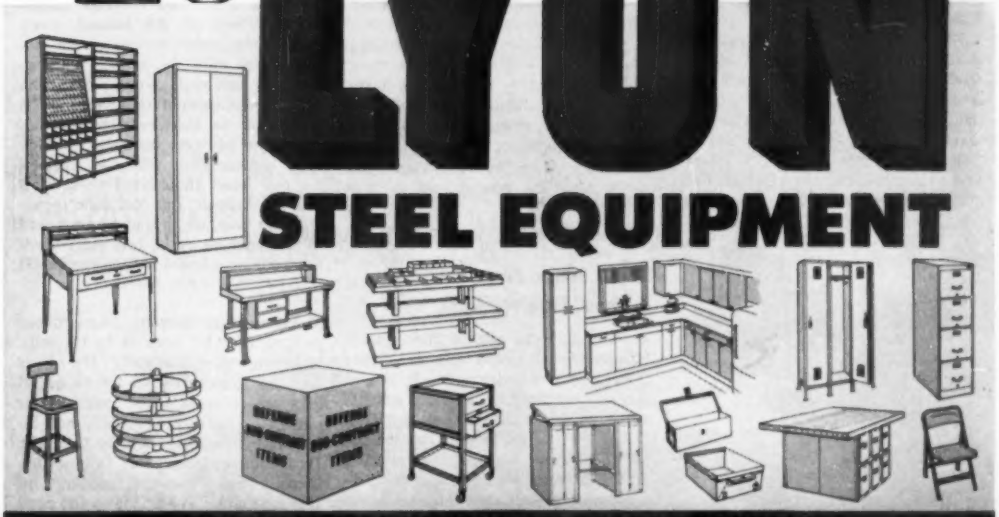
LYON METAL PRODUCTS, INCORPORATED

General Offices: 1189 Monroe Avenue, Aurora, Illinois

Sold Nationally Through Dealers and Branch Offices

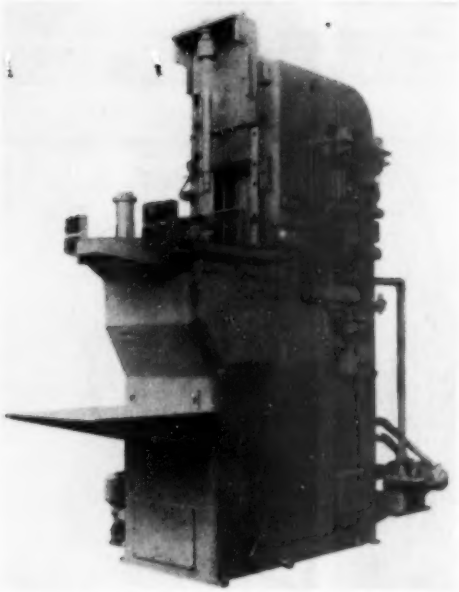
LYON

STEEL EQUIPMENT



A PARTIAL LIST OF LYON STANDARD PRODUCTS

• Shelving	• Kitchen Cabinets	• Tool Toters	• Economy Locker Racks	• Display Equipment	• Filing Cabinets	• Service Carts	• Tool Stands
• Lockers	• Cabinet Benches	• Bar Racks	• New Freedom Kitchens	• Flat Drawer Files	• Folding Chairs	• Sorting Files	• Shop Boxes
• Stools	• Storage Cabinets	• Tool Boxes	• Toolroom Equipment	• Revolving Bins	• Work Benches	• Drawer Units	• Tool Trays
• Bin Units	• Drawing Tables	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks



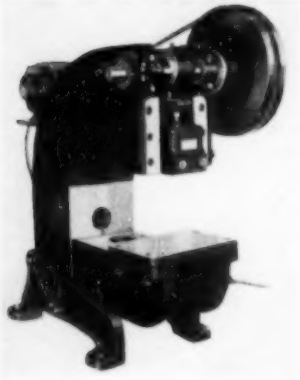
Automatic Flash Lathe for Both Plastic and Metal Parts

Ten-spindle automatic flash lathe handles various finishing operations on circular plastic moldings, and secondary operations on small circular metal parts such as flash trimming of die castings, finishing of electrical parts, deburring, and a number of finishing operations.

The machine has a ten-spindle rotary table, the spindles having a variable rate of from 700 to 2000 rpm. The top wheel is adjustable up and down, and spindles of this wheel retract for work ejection and loading. Top cam allows spindles to lower and hold work directly after loading, and locates it for finishing operations at various work stations. If necessary, bottom spindles can be provided with collets, eliminating top-pressure spindle assembly.

The ten station index is air-powered, hydraulically checked, and electrically controlled. Other features include full control on rate of index, gradual approach to tooling, and metered time at stop position. Tooling supplied by the manufacturer consists of motor-driven buffing wheels, motor-driven abrasive-or buffing-belt units, carbide file-flashing units, micrometer adjustable cutters, crimping rolls, grooving knives, grinding wheels. Capacity is diameters up to 4½ in. with heights to 8 in.

J M Nash Co, 2360 N 30th St, Milwaukee 45, Wis.



Single Punch Press Acts As Four Separate Units

This 4- or 5-ton punch press has a 12¾-in. throat, found only on presses costing up to 4 times as much. Speed can be regulated by a single adjustment for 90 to 280 strokes per min.

The 275- to 450-lb unit has an adjustable ram clamp; clutch-drive safety feature which shears at excessive overload, preventing press breakage; non-repeat safety mechanism eliminating double trips; and 3-in. drop in movable bed.

Kenco Mfg Co, 5211 Telegraph Rd, Los Angeles 22, Calif

PULL-DOWN BROACHING MACHINE is equipped with interchangeable base fixtures and tooling for broaching the round and serrated holes in seven different tank arm and spindle parts. The holes broached are approximately 3¼ to 3½ in. dia. Stability has been built into the machine by having the machine slide and retriever slide move on the same ways. The retriever guides the rear end of the broach down through the major portion of the cutting stroke. With the broach held securely at both ends during most of the stroke, misalignment and vibration is minimized. An electrical interlock between the retriever and the machine cycle automatically stops the cycle if the pull head should fail to connect with the broach. The hydraulic receding work slide, which is also interlocked to the machine cycle, facilitates loading.— *American Broach and Machine Co, 415 W Huron, Ann Arbor, Mich.*

Metal-cleaning solvent, when mixed in a solution of from ½ to 1% with water at approximately 180 F is claimed to remove all traces of oil and grease from metal parts. It is neutral, odorless, non-toxic, non-inflammable and harmless to the skin. It is non-corrosive to aluminum, brass, copper, and most other nonferrous metals. It eliminates the need for chlorinated or inflammable solvents now being used in the cleaning of aluminum.

Wayne Chemical Products Co, Copeland & MCRR, Detroit 17, Mich.

FOR BETTER VAPOR DEGREASING . . .

Du Pont "TRICLENE" D offers you trouble-free performance

(TRICHLORETHYLENE)

Good, economical vapor degreasing requires a solvent that has been specifically designed for the job. That's why so many manufacturers specify Du Pont "Triclene" D Trichlorethylene. They know that this rugged solvent offers trouble-free performance in all kinds of degreasing operations.

Chemically inactive inhibitors in "Triclene" D help assure freedom from deposits and stains—even on copper bearing alloys and other sensitive metals. Uniform distribution of these inhibitors in the solvent is maintained at all times during the boiling-condensing cycle. And because "Triclene" D is chemically stable, there's minimum formation of inorganic salts . . . maximum recovery of stabilizer from sludge.

"Triclene" D is neutral . . . stays that way through countless degreasing cycles. Stabilizers in its formulation prevent solvent breakdown. Other plus values of "Triclene" D include a narrow boiling range, high purity and low residue on evaporation . . . properties that make it the ideal solvent for removal of modern lubricants on industry's toughest degreasing jobs.

PERFECTED BY RESEARCH "Triclene" D meets exacting federal and military specifications, yet costs no more than other leading brands of degreasing solvents. It is available nationally in 55 gallon drums and tank cars. Distribution points in over 100 principal cities are ready to serve you promptly. And Du Pont technical men will be glad to work with you in keeping degreasing installations operating at peak efficiency.

VALUABLE INFORMATION on "Triclene" D is yours free in the 20-page booklet "Vapor Degreasing with Du Pont Non-Flammable Solvents." It shows you how and where "Triclene" D can save time and cut costs in metal cleaning. Send in the coupon below for your copy.

DU PONT
first in solvents for
VAPOR DEGREASING

DU PONT 150th Anniversary

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

E. I. du Pont de Nemours & Co. (Inc.)
Electrochemicals Dept., Wilmington 98, Delaware

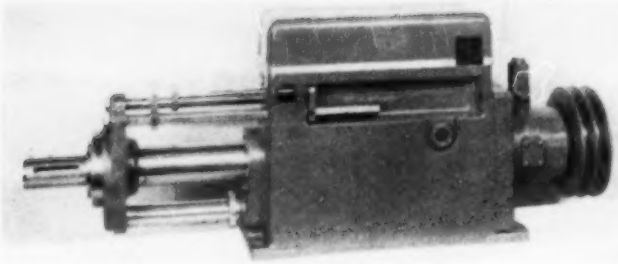
Please send me detailed information on vapor degreasing with "Triclene" D, including your free 20-page booklet. I am interested in cleaning_____products.

Name_____ Position_____

Firm_____

Street & No._____

City_____ State_____



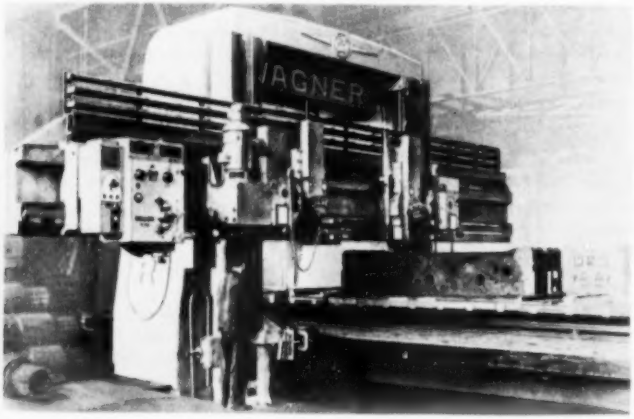
Compact Drilling Unit Mounts in Any Position

The Drillunit is a small self-contained head which can be mounted on a machine in any position for extra drilling and boring jobs. It weighs 175 lb and has few parts.

The spindle is direct-driven by an electric motor; control is by pushbutton; traverse rate is over 400 ipm, feed rate up to 30 ipm; and capacity ½ in. in steel.

Speeds can be varied by changing sheaves and belts. Multiple heads can be mounted to the flange of the quill.

Drillunit, Inc., 637 Mt. Elliott, Detroit 7, Mich.



8 Different Machining Operations On Planer with Single Setup

Transverse, vertical, bevel and longitudinal planing operations can be carried out with a single setup on work as large as 177 in. wide by 110 in. high by 394 in. long on the Wagner double-column planer. Other operations possible with the same setup include vertical and bevel slotting, longitudinal and transverse milling.

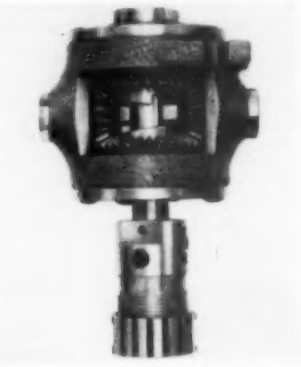
This feature is of particular importance in the machining of such pieces as large dies for forming aircraft parts. On conventional planers it is frequently impossible after planing in one direction, to realign the piece for planing at right angles. On the Wagner machine, the left-hand cross-rail head has an infinitely variable drive for feeding it along the cross-rail, permitting transverse planing with original setup and with the longitudinal movement immobilized.

For further savings in setup time, the table is divided longitudinally into two sections with independent travel. While one piece is being machined on the section of the table under the cross-rail, a second piece can be setup on the stationary section of the table.

All motions are pushbutton controlled from a central point—no levers or handwheels are used. In addition to the central control, electromagnetic-mechanical devices provide portable pushbutton control of horizontal and vertical feed motions, rapid traverse and inching approach (the last with movements as short as 0.0004 in.) Two heads on cross-rail and on side column have independent power drives.

Since no spindles or feed shafts are used in driving the cross-rail and heads, a more compact design of columns and rails is possible. Heads are brought into a more favorable position from the standpoint of stresses and torsion. This construction also permits ease of removal and replacement of heads and changing from planing to milling or grinding operations. Imported by:

Kurt Orban Co Inc, 205 E 42nd Street, New York 17, N Y.



Small Tapper with Large Capacity for Any Drillpress

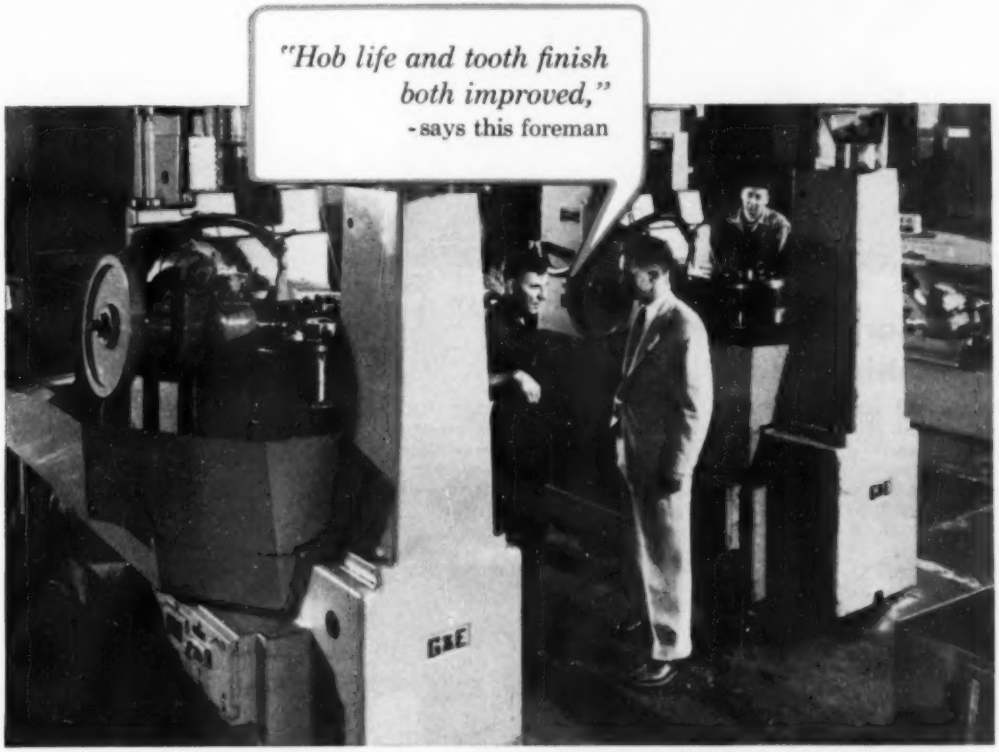
This Burgmaster tapper is claimed to be one of the smaller units with a large capacity for any type of drillpress. Range is No. 10 to ½ in. NF with two collets; collets are No. 10 to 5/16 in., and 5/16 to ½ in.

Positive drive assures accurate threads easily changed from right- to left-hand tapping. Gears and clutches are in one piece, as are spindle and chuck; unit is equipped with ¾ in. to No. 16 female thread. Taps are centered and held securely by rubber-fix tap chucks, and are driven through a tang drive.

Burg Tool Mfg Co, 3713 Durango Ave, Los Angeles 34, Calif

alloy steel drive gears for M-47 tank

hob better with GULF ELECTRO CUTTING OIL!



Operation—cutting involute teeth on alloy steel spur gears, Gould and Eberhardt Gear Hobbers; results with Gulf Electro Cutting Oil—Hob life increased 20%, scuff marks eliminated on gear teeth, and hob grinding costs reduced.

Here's the important reason why Gulf Electro Cutting Oil produces outstanding results like these: Thanks to a special Gulf process of combining sulphur, it provides greater sulphur activity over the entire range of a cutting operation. This means longer tool life and better finishes.

Call in a Gulf Sales Engineer today and arrange to use this quality cutting oil on your tough machining operations, or send the coupon below for additional information.

GULF SERVES INDUSTRY

Gulf Oil Corporation · Gulf Refining Company AM
719 Gulf Building, Pittsburgh 30, Pa.

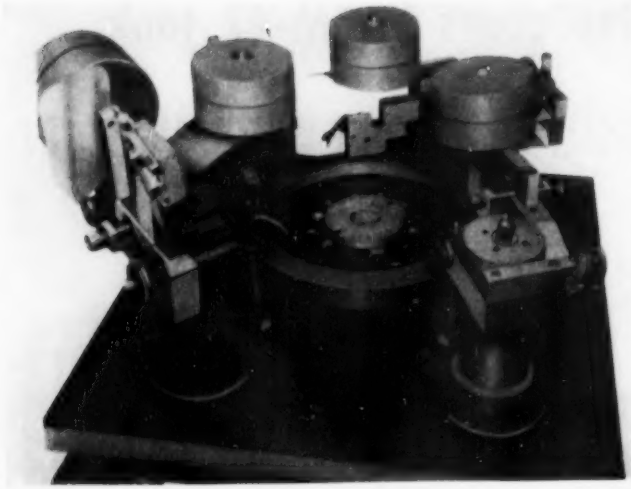
Please send me, without obligation, a copy of your pamphlet "Gulf Electro Cutting Oil."

Name .....

Company .....

Title .....

Address .....

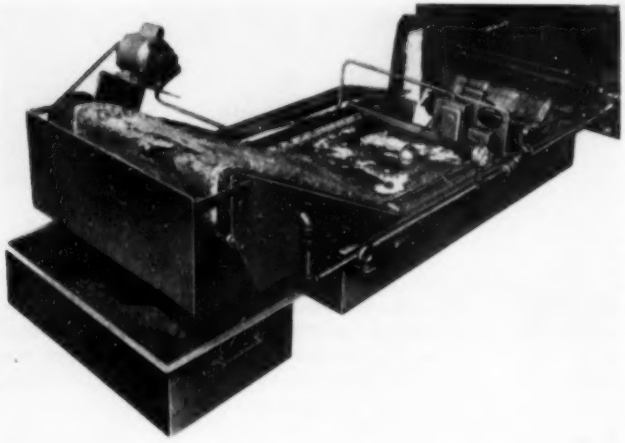


Solid Carbide Blanks Ground On Multiple-Head Machine

Multiple-head surface grinder produces a finish of 1 to 2.5 μ-in. rms on solid carbide blanks. It uses a 150-grit diamond wheel and is reported to hold dimensions to plus-or-minus 0.0002 in.

It is claimed the wheel can be dressed and accurately trued in a few minutes. Diamond salvage is less than one carat per lb of sludge.

Spike Manufacturing Co, 24609 Middlebelt Rd, Farmington, Mich.



Delpark Endless-Belt Filter Uses Same Media Over and Over

This filter, designed to serve individual machine tools or large, central coolant systems, can also be applied to filtering of oils used in run-in of engines, gears, transmissions, test-stand oil for hydraulically operated parts, quenching oils, parts-washing solvents, and others.

It filters solids from liquids that will flow by gravity through the filter material and discharges the solids in a relatively dry state into an outside container. The filter material, in the form of endless belting, rests on a flat, endless conveyor of open construction. Sloping sides form a shallow pool and an inclined discharge ramp provides for the removal of solids.

The filters in many cases fit into or over existing cooling tanks. Capacities range from 2 gal. per min to units capable of filtering 1000 gpm.

Industrial Filtration Co, Lebanon, Ind.

Bench Machine Speeds Deburring, Tube Reaming, and Facing

This bench end-finishing machine enables the operator to clamp and feed the work to the cutting tools with a single forward movement of a hand lever. Because the operator has one hand free, faster stock handling and loading is possible. Work is automatically released by simply reversing the hand lever. For depth of cut, an adjustable swing stop, operated by feed rack provides fast and accurate positioning and gaging.

The machine illustrated handles stock up to 2-in. dia. It is a portable unit, has a three-speed sheave, ½-hp motor, and weighs 170 lb. Three typical sizes of inserts are for ¼-, ¾-, and 2-in.-OD stock. The unit also has the capacity for handling single-point boring, light forming, and turning. Other models with air clamping and air feed, and larger sizes for heavier work are also provided.

Pines Engineering Co Inc, Aurora, Ill.

What do you do when it takes hours... sometimes days... to change v-belts?

1 **Put one or several maintenance men on the job**

...and pay for repairs while production stands still

2 **Pay overtime**

...and have repair costs eat away your profits

3 **Standardize on VEELOS...**

...and change belts in up to 1/10th the time
...save labor, save time and save overtime
...keep machines producing for maximum profit

Comparison proves the value of VEELOS...

Minimum Inventory—4 reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts. If you use only one width of v-belt you can stock just one reel of Veelos.

Quick Installation—link construction makes it unnecessary to remove outboard bearings.

Complete Adjustability—vibrationless, full power delivery is assured because uniform tension on each belt in a matched set can be maintained.

VEELOS
THE LINK
V-BELT

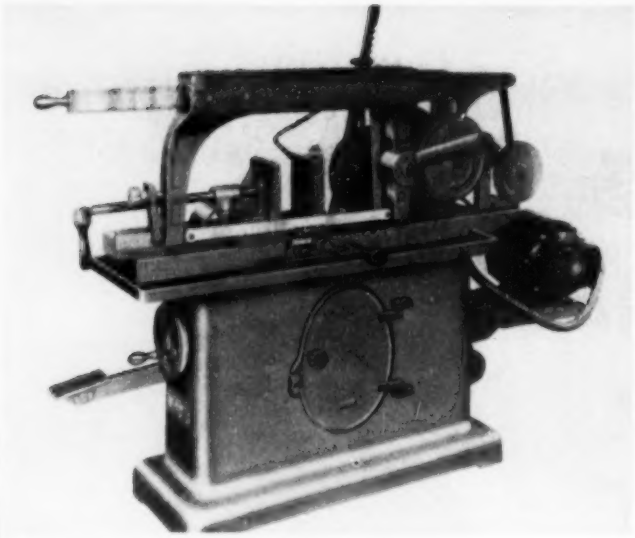
VEELOS DATA BOOK

gives complete details on construction, installation and uses. We'll gladly send you a free copy of this 28-page fact-full book... write today.

MANHEIM MANUFACTURING & BELTING COMPANY
601 Manheim St., Manheim, Pa.

ADJUSTABLE TO ANY LENGTH · ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also in double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.



Keller Power Hacksaw

The No. 5 power hacksaw has capacity for a 9¼ in. round, or an 8x9-in. flat.

It is provided with cabinet base, automatic lift on the reverse stroke, and foot lever to help hold frame in position while loading or unloading the saw or setting it for desired material length. A blade-pressure regulator is controlled by a wheel at the front of saw, providing pressures from 0 to 200 lb. This enables the saw to cut any material from the lightest-wall tubing to heavy steel shafting.

A swivel-base vise has quick adjustable sliding jaws and a single screw. Guide bars on the frames are brass ways and are adjustable for wear. All bearings have Oilite bushings.

Standard equipment includes automatic stop switch and hinge motor bracket for belt take-up and quick changing of saw speed.

Sales Service Machine Tool Co, 2363 University Ave, St Paul, Minn.

Magnifier Equipped with Built-In Illumination

This electrically lighted magnifier is designed to speed detailed examination of all kinds of materials and products through self-contained direct illumination on the object.

Instrument's lens system magnifies five times, and is highly corrected to eliminate spherical and chromatic distortion.

The unit can be equipped with either of two illuminator handles, one battery-powered, the other for connection with a 110-v power source. Each fits a reflector shade into which the magnifier snaps. Accessories furnished without extra cost include a non-illuminating handle and a metal tripod, which multiply magnifier's uses.

Bausch & Lomb Optical Co, Rochester, NY

Chromium-Carbide Gage Blocks Last Longer, Cost Less

Chromium-carbide gage blocks have an expansion coefficient identical with steel. They can be used interchangeably, weigh about the same as steel blocks, and half as much as tungsten-carbide.

Wearability is many times that of other materials, assuring longer life accuracy, and reduction in replacement costs. The metal will not oxidize at temps up to 1000 F, and resists acids.

Blocks will not expand or shrink with age, and do not alter size, or chip from internal structural changes caused by instability. DC units are available in A and B grade accuracy in 83-, 37-, 35-, and 8-piece sets with size range from 0.010 in. to 20 in.

DoAll Co, 254 N Laurel Ave, Des Plaines, Ill

Improved Spindle Cuts Air-Riveter Noise

A rotating hammer that can be regulated for force, speed, and duration of blows is a feature of the improved Airflex pneumatic riveter.

Bent rivets, improperly formed heads, loose joints, and metal flaking are claimed to be eliminated because the peen rotates to strike only a small portion of the rivet head with each blow.

The riveters are semi-automatic, operated with an air timing valve that powers the riveter in a continuous cycle as long as the pedal is depressed. The time valve may be set to a lag of ½ sec on up.

Blow force and hammer speed can be adjusted independently of each other; from 5 to 80 psi, and from 6000 to 16,000 cycles per min.

Two models are available; a standard vertical (floor or bench style), and double-end model for heading both ends of a rivet.

Lemert Engrg Co, Plymouth, Ind

RUGGED MOTORS help

KEEP PRODUCTION ROLLING

Century Motors are designed for stamina, engineered for long, dependable service, carefully tested and balanced for precision performance.

What's more, you can select a size and type of Century Motor that's exactly right for your particular job. They're built in sizes from ⅛ to 400 h.p.—to meet all kinds of atmospheric or plant operating conditions.

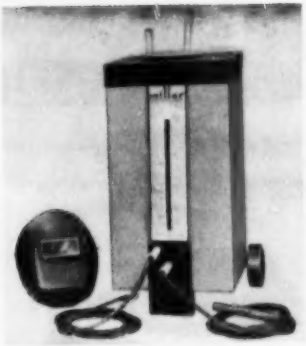
Why settle for less than a Century, when you specify your next electric motor?

Century C MOTORS

CENTURY ELECTRIC COMPANY
1806 PINE STREET • ST. LOUIS 3, MISSOURI

CE-754

OFFICES AND STOCK POINTS IN PRINCIPAL CITIES



Small Electric Welder

This small ac welder can be used on standard 110- or 220-v power supply line and will handle electrodes from 1/16 to 5/32 in. (when on 110 v the maximum is ⅛-in. electrode).

It has movable primary coils which permit infinite current adjustment throughout the entire welding range. Smooth, resettable current control is obtained through the adjustable handcrank mounted on top. It has two welding ranges—high and low, with an amperage scale on the front. The primary coils are air-spaced, with glass-covered magnetic wire.

It is equipped with 2 rubber Oilite-bearing 5-in. wheels and handle so that it can be easily moved. It comes equipped with detachable welding cables with jack plugs. List price is $95 plus accessories.

Miller Electric Mfg Co, Appleton, Wis

Toolmakers' Parallel Clamps

A line of toolmakers' parallel clamps are available with openings ranging from ⅝ to 3½ in. They are claimed to compare in quality with the finest on the market, and said to be competitively priced. They are hardened throughout and have metal clips to hold the screw in place on the return.

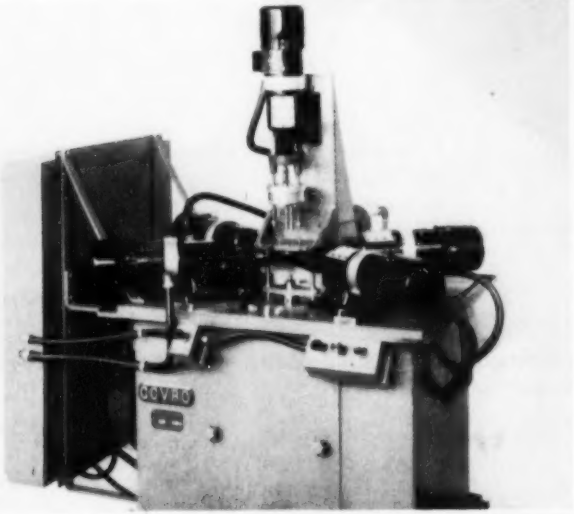
Dept 16, Precision TC Co, 1305 S Laramie Ave, Cicero 50, Ill

McCoy Shearing Tool Cuts 14-Gage Stainless

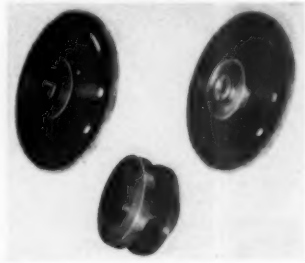
Shearing tool that cuts 14-gage stainless and mild steel up to ⅛ in. thickness operates on a simple leverage principle. It is portable, weighs 9 lb, and can easily be used in almost any bench vise.

Cutting with the tool reduces curling and burring to a minimum. It cuts straight lines, curves, right angles.

McCoy Product Co, Inc, Salt Lake City 1, Utah



SPECIAL MACHINE DRILLS seven holes at once, and insures the proper location of the holes in the work. Five radial holes and two parallel holes are drilled simultaneously in an aluminum part. Six Model KH Govro-Nelson self-contained automatic drilling units are used. Output rate is 500 parts per hr. The operator loads the part and touches the start button, whereupon the part is automatically clamped, drilled, and unclamped. —*Govro-Nelson Co., 1933 Antoinette, Detroit 8, Mich.*



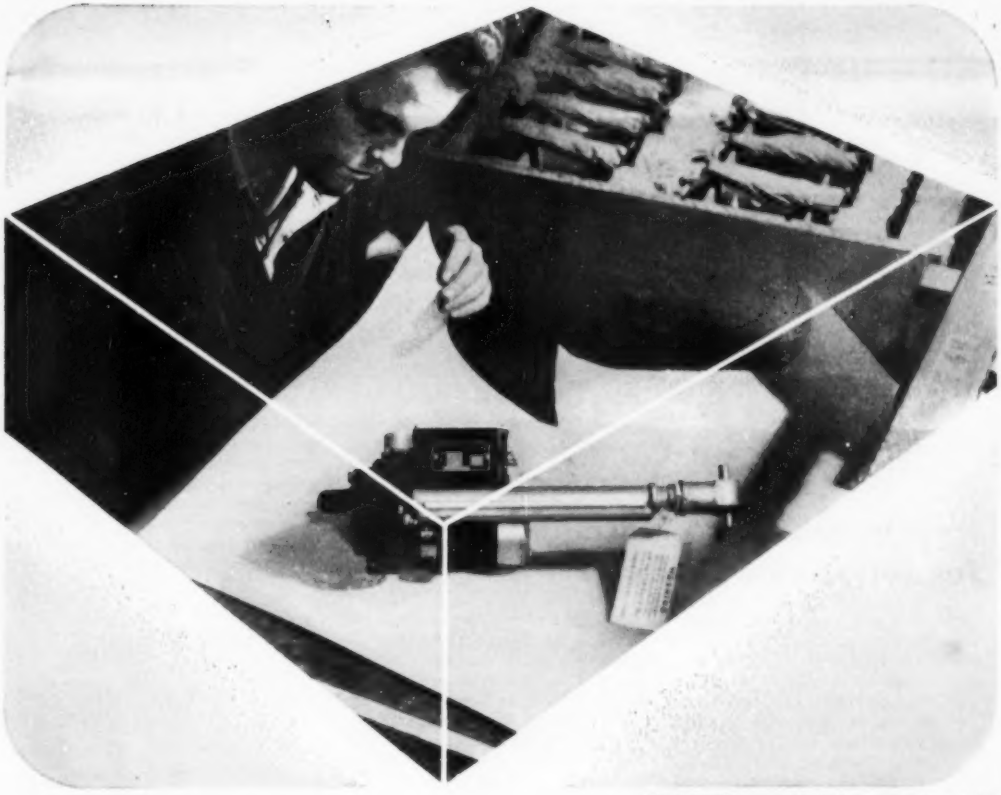
Reversible Wheel Adapter Saves Retruing Wheel

The adapter is shown mounted on a standard periphery diamond wheel. When the wheel wears on one edge, as from grinding forms or chip-breaker grooves, it can be reversed on the spindle without the delay and expense of retruing the wheel.

The adaptor can be used on formed or angular periphery surface grinder wheels to permit quick and accurate wheel reversal for grinding left- and right-hand tools or parts.

The adapter is designed for No. 2 Brown & Sharpe and similar machines having a 1 in. spindle with 3 in./ft. taper, and has a lockwasher to prevent loosening.

Detroit Milling Cutter Co, 8625 Grand River Ave, Farmington, Mich



Shell "VPI"-protected airplane parts. Over 1,000 different parts stored for over a period of a year—all wrapped in Shell "VPI" paper—no rejects due to rusting.

New packing technique HALTS RUST DAMAGE

. . . cuts packing costs as much as 60%

THE GOOD WORD AMONG steel packagers and shippers today is that rust can now be prevented by Shell VPI® (a volatile corrosion inhibitor). Composed of solid amine nitrites, Shell "VPI" vaporizes and when moisture is present in the air . . . renders this moisture noncorrosive. Containers need not be airtight, however, for excellent corrosion protection.

In terms of packing costs, this new technique is so much simpler and faster that costs have been cut as much as 60%.

This can be traced directly to the fact that Shell "VPI" may be applied quickly and easily in either crystalline form or as a coating on wrapping paper. Hence rust-preventive measures are greatly simplified and container costs are reduced. And, of course, rust removal before the product's use is unnecessary.

Other major advantages of Shell "VPI" are: Low cost . . . Long periods of volatility . . . Nontoxic . . . Elimination of greasing and degreasing . . . Harmless to plastics or ferrous metals.

Consult your Shell Representative about this new method of rust prevention today. Or write to nearest address listed below.

SHELL OIL COMPANY

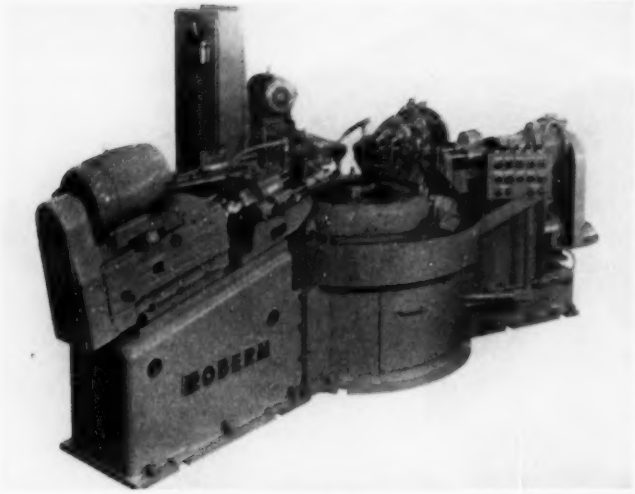
50 West 50th Street, N. Y. 20, N. Y.
100 Bush Street, San Francisco 6, Calif.

SHELL®

SHELL "VPI"

(a volatile corrosion inhibitor)

stops air and moisture from making rust.



Five-Way Drilling Machine For Jet-Engine Housings

This machine features interchangeable multiple drillheads on two of the five stations. This enables several types of housings having a variety of bolt-circle specifications to be machined on faces with identical radial locations.

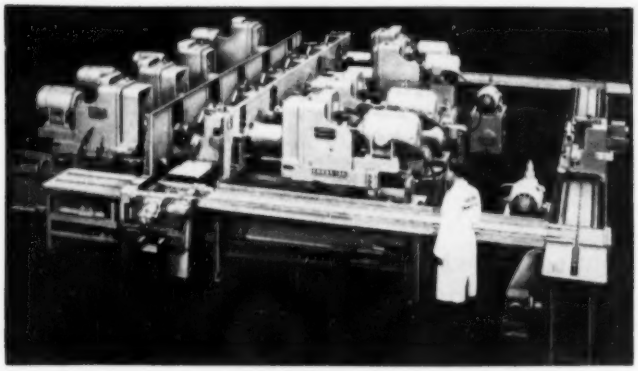
Loading, clamping, and indexing of the housings in the fixture is done manually in order to produce a precise part with minimum scrap.

The aluminum-alloy housings are loaded in the fixture where they are located by an OD ring and a pin in a bolt hole. The fixture is rotated clockwise by hand to positions where individual hold-down clamps can be tightened. After clamping, the fixture is brought to the starting position and the index lever operated to lock the fixture in place. With the actuation of the index lever, three air-operated, index-table hold-down clamps are applied. By pushing the reset button, a counter and circuit for predetermined automatic selection of head combinations are then set.

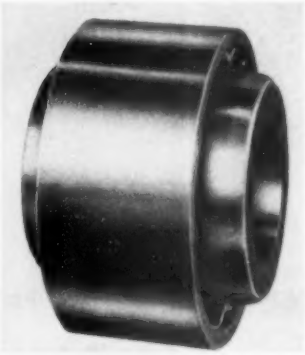
Indexing between operations is done manually by rotating the table after the index pin and clamping cylinders have been automatically released by the return stroke of the heads. The index pin is again pushed into operating position after indexing and the table clamps energized. The cycle start button is next operated and the correct heads begin to feed. Eight stations and nine operations complete the multiple drilling and multiple tapping needed.

If tool breakage occurs at any point in the cycle, a manual automatic switch can be operated and the head can be jogged through successive positions without the heads feeding. An emergency return button is provided to return all heads to idle position.

Modern Industrial Engineering Co, 14230 Birwood, Detroit 4, Mich.



TRANSFER MACHINE finishes 6½ tank idler arms per hour. The material is cast armor with a Rockwell-C hardness of 36. Operations include core-drilling and reaming the small hole and hollow-milling the boss around the small hole, rough and semi-finish boring the large hole, and trepanning the groove on one end. Six stations are used, one for loading and five for machining. Because of the odd shape of the idler arms, palletized work-holding fixtures are used to hold each part during all operations. An integral conveyor returns the fixtures from the last station to the loading station.—*The Cross Co, Detroit 7, Mich.*

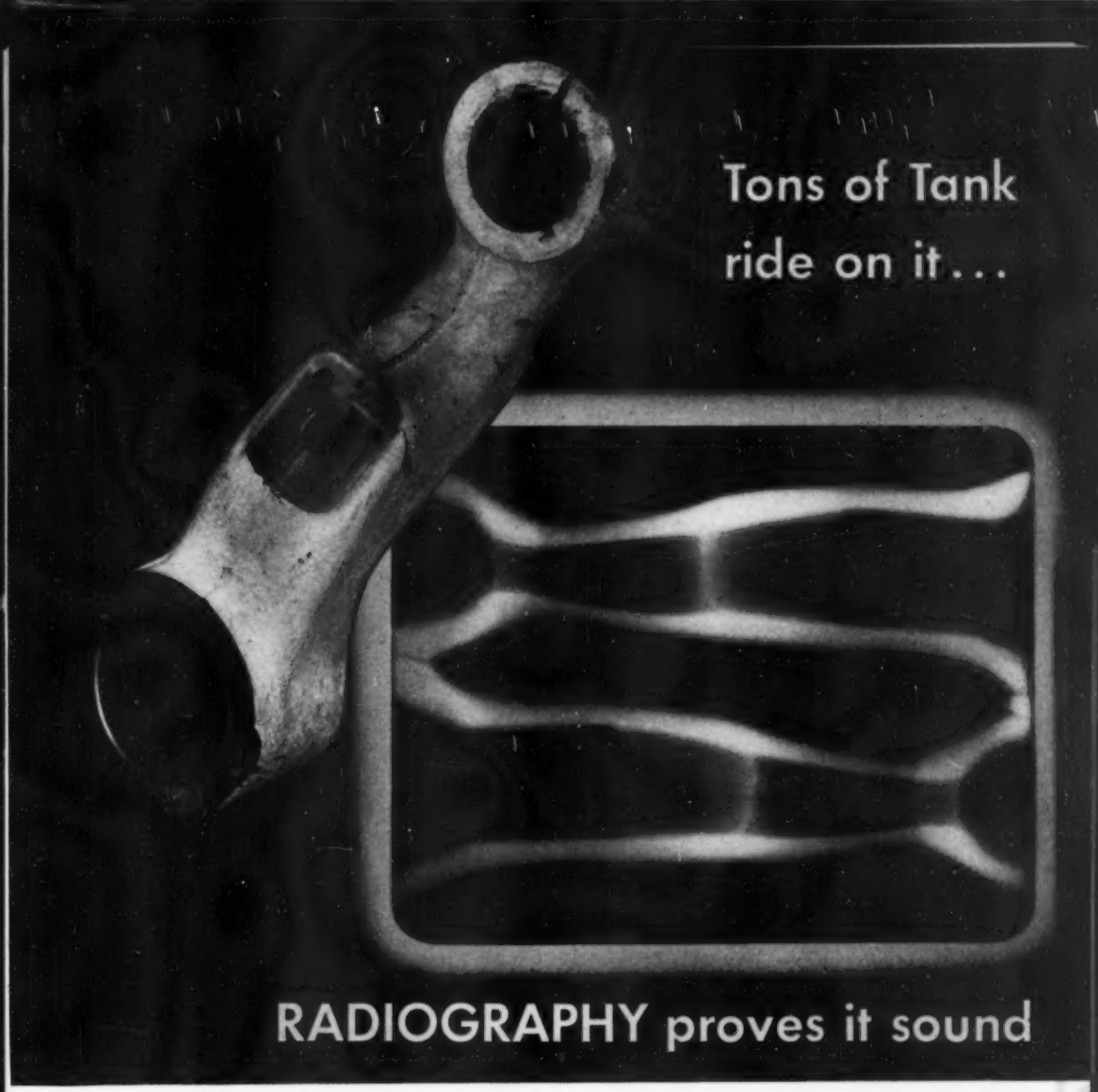


Cone-Drive Couplings Take Up to 500 HP

Cone-Drive flexible couplings for Cone-Drive worm shafts, gear shafts, and motor shafts have been announced. These are gear couplings with seven parts: A sleeve, two hubs, two neoprene seals, and two snap rings. Hubs and seals are SEA 1045 steel forgings with 90,000-psi tensile strength. The couplings allow an average of 3° angular misalignment and 1/16 in. offset.

Standard couplings are made in 22 bore sizes ranging from ¾ in. to 6½ in., with capacities from 4 to 550 hp. Larger sizes can be furnished by request.

Cone-Drive Gears Div, Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich



It's the arm that carries the rear caterpillar track wheel of a tank. Failure would mean complete disablement—so soundness in the casting is a "must."

To make sure, the casting is radiographed. It's the one way to learn internal conditions without destroying the part.

Cases like this show why radiography is becoming routine in foundries everywhere. It helps earn a reputation for constant top-quality work—frequently suggests changes in operations that bring higher yields in production runs.

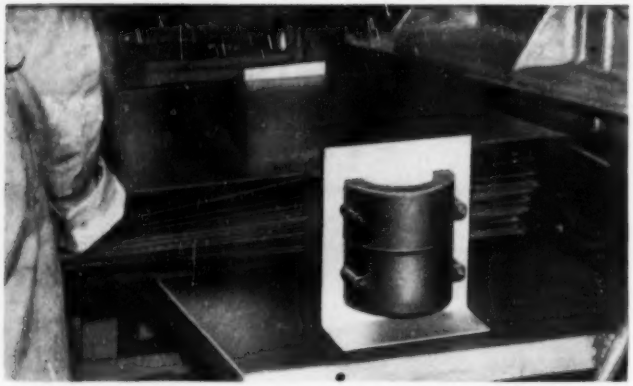
Your x-ray dealer will be glad to discuss ways radiography can increase your production. Get in touch with him. Also send for a free copy of "Radiography As A Foundry Tool."

EASTMAN KODAK COMPANY
X-ray Division, Rochester 4, N. Y.

Radiography...

another important function of photography

Kodak
TRADE-MARK

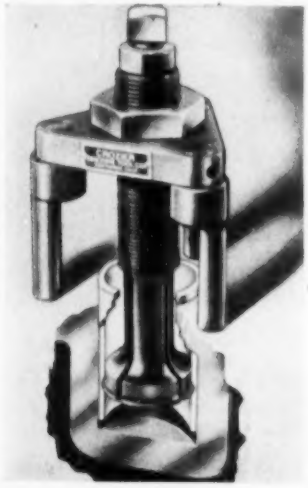


Caufield Sheet-Steel Separator

This unit permits automatic separation of stacked steel sheets. It eliminates trying to pry oily sheets apart with hands or a sharp instrument. The unit raises the top sheet about 2 in. above the balance of the stack. As each steel sheet is removed, the next one is raised and separated ready for immediate transfer.

Separator prevents damage to expensive dies by eliminating possibility of feeding double sheets. They are used singly or in pairs, depending on the size sheets to be handled. Four sizes available are 6½, 9, 10, and 15 in.

Clark-Hopkins Equipment Corp, 1124 Spring Garden St, Philadelphia 23, Pa



Crozier Bushing Extractor For Blind Holes

This bushing and bearing extractor for blind holes is claimed to eliminate the necessity of matching bearings, minimizes the hazard of injuring casings or excessive dismantling of equipment.

Unit consists of eight threaded expanding arbors, a draw table with two sets of legs, short and long, adjustable as to distance from the work; they can handle any hole from ½ in. to 2 in. dia. Max of 2½ in. may be drawn at one setting, and press fits of over five tons have been extracted easily with the unit.

Crozier Machine Tool Co, 6814 N Prairie Ave, Hawthorne, Calif

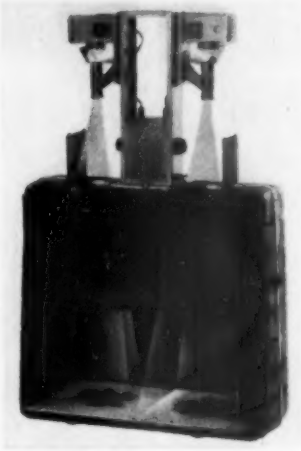
Flexible Plastic Tubing Has Stainless-Steel Outer Braid

This form of Tygon tubing is chemically resistant, translucent, nontoxic, and especially designed for high-pressure applications.

Because of the braided stainless-steel reinforcement, the tubing absorbs vibrations and does not crack, leak, or break under working pressures up to and including 300 psi. Because it is translucent, it permits visual inspection of flow and simplifies cleaning.

The tubing is stocked in two sizes of ¼ and ⅜ in. ID and is available in six standard formulations in the running or fitted lengths. All fittings are stainless steel. The ¼-in.-ID fittings can be field applied, while the ⅜-in.-ID crimp fittings are factory applied.

US Stoneware Co, Akron, Ohio



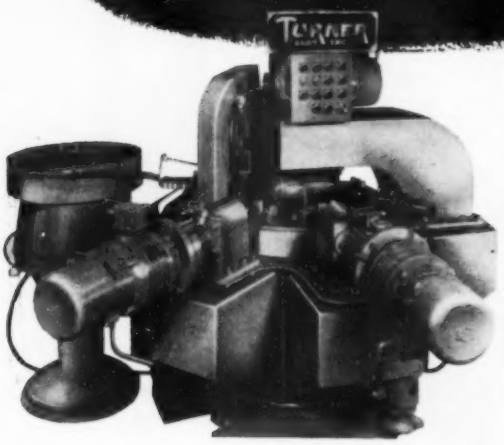
Faxfilm Surface Comparator

Greater flexibility of use, increased portability, and more pleasing appearance feature the Model BL-122 Faxfilm surface comparator. Faxfilm is a method of surface study in which a clear plastic replica of a surface is made in about a minute, and projected in a microprojector to show minute details of surface condition.

The BL-122 provides comparison projection of two Faxfilm replicas at 30-dia magnification. Its principal uses include comparison of work specimens with standard finishes and surface roughness inspection, comparison of finishes obtained in machinability studies, and comparisons of surface changes in wear and life tests. The comparator is 25x12 in. at the base and 22½ in. high. Including an accessory and file case, carried in the base, total weight is less than 30 lb. The microprojectors use Wollensak 1-in. f:1.9 projection lenses.

Brush Development Co, Instrument Div, 21G, 3405 Perkins Ave, Cleveland 14, Ohio

TURNER AUTOMATIC INDEXING MACHINE



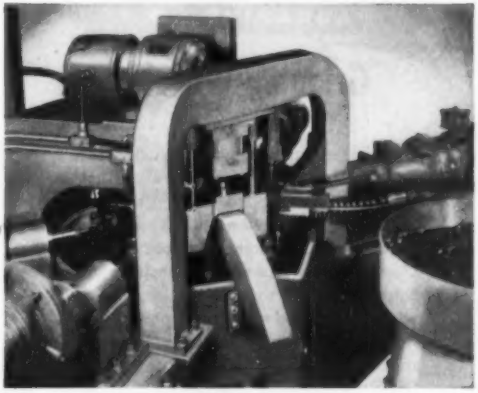
drills, chamfers and reams 600 piston rod ends per hour!

STATION NO. 1, hopper-fed automatic loading and cam-clamping
STATION NO. 2, drill 7/16" hole 1/4" deep
STATION NO. 3, drill 7/16" hole through
STATION NO. 4, electric check 7/16" hole to determine if hole is through
STATION NO. 5, chamfer inside of hole
STATION NO. 6, chamfer opposite side
STATION NO. 7, ream .4385-.440" hole
STATION NO. 8, unload; automatic air ejected

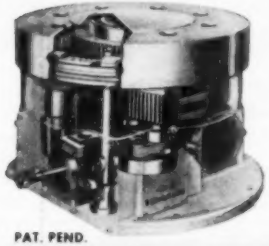
Here is how the piece is automatically fed into the Turner Machine and ejected in one complete cycle

The view of the opposite side of the Turner Indexing Machine with the Model 24-B Turndex shows the pieces coming from the syntron hopper and being fed into the automatic loading device. The pieces are then taken from the loader into the fixture. After the piece is placed in the fixture it is automatically clamped in place by means of a cam attached to the Turndex Indexing Table.

When the pieces come to the unloading station, each piece is automatically unclamped and an air cylinder mounted above and attached to a chute picks the piece out of the fixture and automatically ejects it into a tote pan.



The "brain" of the Turner Machine is the Model 24-B Turndex Indexing Table



PAT. PEND.

Developed under an entirely new principle, the Turndex Indexing Table offers a combination of accuracy, speed, smoothness, power and versatility never before achieved by the commonly accepted types of indexing tables. For complete details about this table and the special machines, jigs and fixtures write us today.

Do you have time consuming machining operations on which you would like to save on manpower, inspection time and floor space? We can help you, why not write us today describing your problem?

TURNER BROS., Inc.
2623 HILTON ROAD
FERNDALE 20, MICHIGAN
DESIGNERS and BUILDERS of:
• SPECIAL MACHINES
• JIGS and FIXTURES

GOOD NEWS for the grinding department

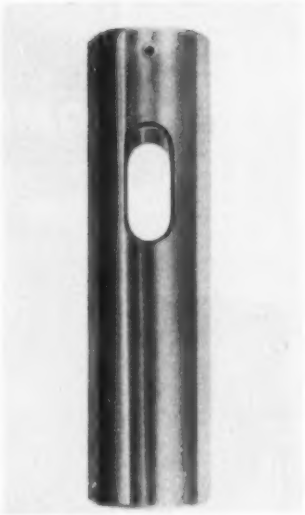
SIMONDS ABRASIVE CO.

Grinding Wheels

Production up! That's the bulletin board's big news . . . good news that started when Simonds Abrasive Company wheels went to work in the grinding department. Simonds complete line includes wheels accurately specified for top results on *your* jobs . . . grinding wheels, mounted wheels and points, segments and abrasive grain . . . all made under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for almost 60 years. Write for free data book and your distributor's name.

SIMONDS ABRASIVE CO. PHILADELPHIA 37, PA. BRANCH WAREHOUSES CHICAGO DETROIT BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd. Arvida, Que.



Turret Toolholder Reduces Overhang

This sleeve stub-taper toolholder for turret lathes and screw machines takes counterbores, countersinks, core drills, and similar tools with stub tapers. The holder results in a simple but rigid tool setup.

OD's are ground for good fit in the turret hole, and the whole holder is hardened to resist nicking and burring. A splined section engages the tang on the shank of the tool for positive drive. It is available for No. 2, 3, and 4 stub tapers.

Scully-Jones & Co, 1902 S Rockwell St, Chicago 8, Ill

Gage Vise Has Unusual Accuracy

Five surfaces of this vise are accurate to 0.0003 in., it is claimed, which saves considerable setup time for milling, drilling, jig-boring, and other machine jobs. The vise is being produced in response to interest shown in it when it was in use at the Erickson shops.

In combination with a sine plate, job adaptability is great. The vise saves time when work is removed

protect your products from mold and bacteria

NOW... LATER!

Dowicide industrial germicides and fungicides are bringing manufacturers who use soluble-oil emulsions protection from bacterial contamination all along the line. Check this list of benefits *you* can derive from the use of Dowicide preservatives.

Dowicide products in soluble-oil emulsions:

1. Prevent emulsion breakdown with its accompanying oil separation and offensive odors.
2. Prevent the clogging of pipes and screens due to emulsion breakdown in coolant and lubricating systems.
3. Extend the service life of the oil emulsions.
4. Prevent the rusting of machines and parts that may result if soluble oils are not kept in good condition.
5. Save time and money formerly spent in mixing new batches of oil emulsions, remachining parts, frequent clean-ups.

If Dowicide preservatives are not already protecting your soluble oils from mold and bacteria, phone, wire or write Dow today for additional information.

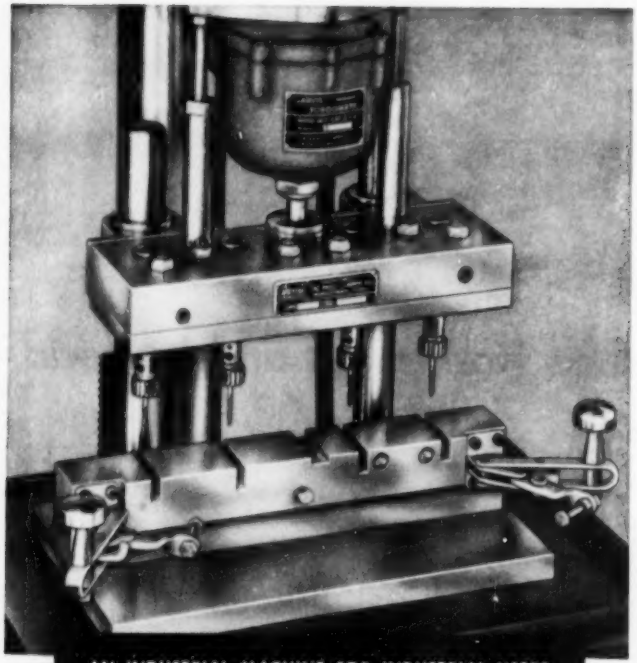
use DOWICIDE

INDUSTRIAL GERMICIDES AND FUNGICIDES

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Atlanta • Cleveland • Detroit • Chicago • St. Louis • Houston
San Francisco • Los Angeles • Seattle • Dow Chemical of Canada, Limited, Toronto, Canada

DOW CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE



AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

Jarvis

MULTI-TAPPERS

for MULTI-TAPPING AND DRILLING

We invite you to consult with the factory-trained Jarvis representative in your territory to analyze and determine the full requirements of your tapping and drilling needs. Write for catalog.

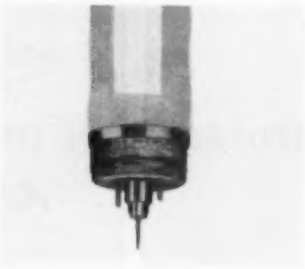
JARVIS POWER TOOLS } TAPPING ATTACHMENTS · TAPS · FLEXIBLE SHAFTS AND MACHINES · ROTARY FILES · TUNGSTEN CARBIDE REAMERS AND MILLS · DRILLS · BORING BITS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

from angle plates and readjusted for later operations.

Vise parts are made of tool steel, hardened and ground throughout. Jaw opening is 2⅝ in., total size is 2⅞ in. square by 6 in. long. Weight is 7½ lb.

Erickson Tools Div, Erickson Steel Co, Hamilton Ave, Cleveland 4, O



Small-Hole Tapping Chuck Has Finger-Tip Control

A finger-tip-control tapping chuck, designed for use with the Commander tapper, permits maximum use of tapper's spring clutch drive and adjustable torque control features.

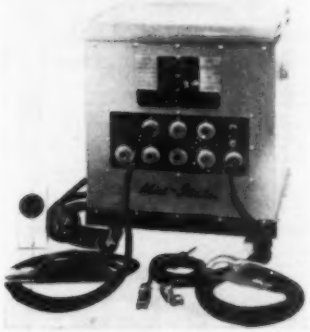
In operation, head remains in a fixed position, as actuation of the tap is entirely controlled by the operator's fingers on the chuck. A ⅛ turn of the drive collar engages or disengages tap from the driving mechanism, permitting the operator to feel the tap as it enters or leaves the work. Vertical movement to ¾ in. is controlled by operator's finger tips.

Close operator control increases sensitivity, and eliminates lost time and waste motion usually encountered when using the drillpress handle. Breakage is said to be reduced because tap can be instantly reversed when necessary.

Commander Mfg Co, 4225 W Kinzie St, Chicago, Ill

Adjustable prop to open a press or die set, or to support a holddown clamp, consists of a cylindrical ram filled with flat steel slugs. When ram is lifted, slugs pour out of an opening and fall into an outer cylinder to form a solid mass of steel on which ram rests. 10-ton load is supported. Ram is returned to original position by turning unit upside down. Standard sizes made in 2½, 3⅜, 5⅜, and 2 in. high; fully extended, they measure respectively 3⅝, 5⅞, 8, and 12 in. high.

Lempco Products Inc, Bedford, Ohio



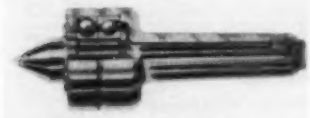
Combination Welder and Charger

Combination ac arc welder and battery charger is reconnectable for 110- or 220-v operation.

The unit has the following features: 15 to 175 amperage output range; 140-amp rated output; arc voltage 25 v; open-circuit voltage 65 v; power-factor correction 75% duty cycle at rated amperage load 50%; duty cycle above rated amperage load 20%; 36-amp draw at 220 v; kva rated output 7.9; battery charging rate 6 dc amperes.

The combination handle rods from 1/16 to 3/16 in. and is also available without the battery charging circuit. The welder meets NEMA Standards and REA Specifications.

Mid-State Welding Mfg Co, 6025 S Ashland Ave, Chicago 36, Ill.



Roller-Bearing Centers for Heavy-Load Operations

This anti-friction Red-E center features an increased head size permitting the use of larger bearings for greater radial and thrust load capacities. Preloaded ball bearings are in a single row. There is a duplex arrangement in the head, and a self-aligning precision roller bearing in the shank.

Labyrinth seal is designed to prevent entrance of cutting oil or chips and escape of self-enclosed lubrication.

Center is of all alloy steel construction with a heat-treated spindle; point is of high-speed steel, ground after assembly to assure accuracy. Female or special points may be used if required.

Ready Tool Co, 55½ Iranistan Ave, Bridgeport, Conn

CUSTOM MADE AT NO EXTRA COST!

Jarvis TAPS

AN INDUSTRIAL TAP FOR INDUSTRIAL USERS

JARVIS *POWER* TOOLS

TAPPING ATTACHMENTS
TAPS • ROTARY FILES
FLEXIBLE SHAFTS and MACHINES • TUNGSTEN CARBIDE REAMERS and MILLS • DRILLS
BORING BITS

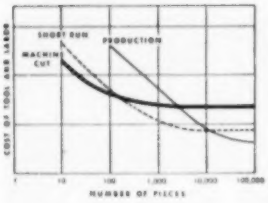
THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

STAMPINGS

Our impartial use of three basic methods gives you economy regardless of length of run.

Most parts can be made by all three methods. But only **one** is **most** economical. The right decision is a technical one, based on **over-all** quantity, contour dimensions, tolerances and materials.

YOUR SUPPLIER SHOULD KNOW ALL THREE METHODS



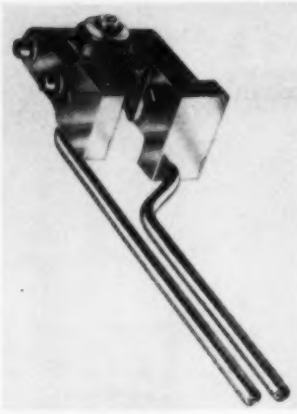
This logarithmic chart shows the effect of these factors on the **specific part** illustrated. From 1 to 150 parts, our own **Machine-Cut Method** with no die cost whatsoever is most economical. At 150 parts, the **Short-Run Method** using economical blanking dies and stock punches is best. At 10,000 units, the standard **Production Method** with standard dies is most satisfactory.

For more information, use coupon on opposite page

STAMPINGS DIVISION

LAMINATED SHIM COMPANY, INC.

3111 Union Street, Glenbrook, Conn.



Tiny Drill Jig Works On Instrument Parts

A reduced version of the "Mijit" drill jig, called the "Jr Mijit," is being made for work on electronics, instrument, and appliance parts. It is self-clamping in any position, using the same handle for locking the part and for locating and holding the jig under the drill. Its range is parts up to a 1½-in. dimension.

Interchangeable bushing plates reduce the cost by making quick changes possible. Shut height is adjustable from 1 to 1½ in. Work area is 1 in. by 1⅛ in. Dimensions of the jig are 1 11/16 by 2 11/16 in., 2¼ in. high when closed. Handles are 6 in. long.

Esco Engineering Corp, 1940 E Woodbridge St, Detroit 7, Mich

Wick-feed oilers are especially suitable for use in dusty surroundings. They are brass bodied, have small capacity, and since they feed filtered oil, dirt cannot reach the bearings. Oil is carried from the body over the standpipe to the bearing by capillary action, assisted by a syphon effect.

Oilrite Corp, 2518 Waldo Blvd, Manitowoc, Wis.

Tellurium-copper alloy has machinability approaching that of free-cutting brass and electrical conductivity 90% of that of pure copper. The combination makes it well suited for the mass production of electrical and electronic connectors and other parts. The addition of tellurium does not adversely affect the hot-working properties of copper. It may also be severely cold-worked, although it is somewhat less ductile at room temperatures than pure copper. The

Books Serve as Tools in Defense Production

Defense production needs have put the spotlight on today's rapid technical developments—in machines, materials, processes, and management. New demands for know-how and skill face your personnel, from top engineering design down through the many levels of supervisory and mechanical shop work. Make sure you get the maximum efficiency and production from your whole staff—give them the advantages of the technical training and upgrading afforded by McGraw-Hill books.

Mechanical Engineers' Handbook

Provides practical data on every branch of mechanical engineering—from aeronautics to mechanical refrigeration, from power generation to welding, from metal-cutting to hoisting and conveying. New materials in the 5th edition include fluid mechanics, aircraft jet propulsion, plastics, industrial supersonics, rocket fuels, and many more. **Edited by Lionel S. Marks, Gordon McKay, Prof. of Mech. Eng., Emeritus, Harvard Univ. 5th Edition, over 2200 pages, 1500 illus., $15.00**

Tool Engineers Handbook

An outstanding reference bringing you authoritative data on the design, fabrication, maintenance, and economical use of industrial tools and machinery. It covers everything from product design and cost estimating . . . through the economical selection of machines, processes and tools . . . to the analysis and improvement of setups and operations. **By American Society of Tool Engineers, F. W. Wilson, Editor-in-Chief. 2150 pages, over 2000 charts, table and diagrams. $15.00**

Handbook on Designing for Quantity Production

Provides the tested rules to enable you to design more economical product parts for mass production quicker. Gives you hundreds of design pointers to follow in designing basic parts for quantity production by stamping, sand casting, die casting, screw machine, die forging, etc., and new material on wire forms, permanent mold castings, impact extrusions. **By Herbert Chase, 2nd Edition, 561 pages, 417 illustrations, tables and charts, $7.50**

Quality-Control Handbook

An outstanding reference bringing you authoritative data on the design, fabrication, product quality at lower cost. Use it for basic or advanced review of all phases, not only the statistical, of the quality-control function—for quick reference to many formulas, data, record forms, and other practical information. Covers economics of quality control; organization for quality; acceptance, control, and assurance of quality; application to specific processes and products. **Edited by J. M. Juran, Consulting Management Engineer. 783 pp., 6 x 9, 176 illus., $10.00**

Materials Handbook

Presents the most pertinent and important facts relating to more than 8800 materials to enable executives, purchasing agents, and engineers to make comparison, avoid checking many sources, and quickly get a working knowledge of the materials best suited for a particular purpose. Gives detailed information on chief characteristics, comparative data, sources, substitutes, adulterants, and uses for each material. Includes a section on economic geography of materials. **By George S. Brady, 7th Edition, 879 pages, $8.50**

SEE THESE BOOKS 10 DAYS FREE

McGRAW-HILL BOOK COMPANY, INC.
330 W. 42nd Street, NYC (36)

Send me book(s) checked below for 10 days' free examination on approval. In 10 days I will remit for book(s) I keep plus a few cents for delivery, and return unwanted book(s) postpaid. (We pay for delivery if you remit with this coupon—same return privilege.)

- ☐ Marks—MECHANICAL ENGRS. HDBK.—$15.00
- ☐ ASTE—TOOL ENGINEERS HDBK.—$15.00
- ☐ Chase—HDBK. ON DESIGNING—$7.50
- ☐ Juran—QUALITY-CONTROL HDBK.—$10.00
- ☐ Brady—MATERIALS HDBK.—$8.50

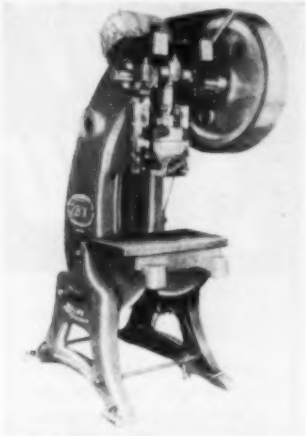
(Print)

Name .....
Address .....
City ..... Zone..... State.....
Company .....
Position FA-11-10-52

This offer applies to U. S. only.

alloy is well adapted for making welding and cutting tips because of its machinabilty and high thermal conductivity. It is supplied in hard or half-hard temper in the form of rod and bar.

Chase Brass & Copper Co, Waterbury 20, Conn.



28-Ton Deep-Throat Press

This press features precision-ground parts balanced and surface finished to Brush analyzer standards. Other features are a carefully ground steel crankshaft, hand-scraped bearings, solid web wheel, and gears.

Known as Model 28X, it locks positively in any inclinable position. A two-button safety device provides for operator protection.

Walsh Press & Die Co, 4709 W Kinzie St, Chicago 4, Ill.

Copyfix, a process for making photo-exact, positive copies of any record, regardless of type or color, reproduces records from originals up to 14 in. wide in any length.

No special installation of the unit is required; machine operates from any electrical outlet, eliminating darkroom. A 10-second period will produce desired copy, ready for immediate use.

Remington Rand, 315 Fourth Ave, New York

Degreasing solvent known as Flow contains diethyleneglycolmonoethylether. The solvent is said to be relatively odorless, easy to handle, and to dry quickly without leaving any film or sticky residue. It is being sold in 50-gal drums.

Curran Corp, Prospect Mills, Lawrence, Mass.

SHIMS

BRING YOUR SHIM PROBLEMS TO "SHIM HEADQUARTERS"

ONLY LAMINATED SHIM COMPANY OFFERS YOU ALL FIVE SOLUTIONS:

THE LAMINUM® SHIM

SIMPLY PEELS FOR ADJUSTMENT
Made up of from 3 to 63 layers of .002 or .003 inch brass or steel, metallically bonded together over their entire surfaces. No dirt between layers. Peels with penknife.

THE LAMISOL® SHIM

FOR QUICK, ASSEMBLY LINE USE
The laminations of the LAMISOL Shim (in brass only) are temporarily joined by spot-soldering on the edges. Gauges and number of laminations within one shim are unlimited.

THE LAMITAB® SHIM

FOR SUPER SPEED, THIN GAUGE SITUATIONS
The little tab holds shim laminations together firmly, yet is easily removed. Different metals can be used in the same shim.

THE LOOSE LEAF SHIM

FOR UNLIMITED FLEXIBILITY
This is the simplest of all custom-stamped shims. It is completely flexible. Usually sets including several different gauges are made up.

PACKAGED SHIM STOCK

READY FOR EASY USE, WITHOUT WASTE
Thin gauge 6" x 100" rolls feed through package slots. Heavier gauges in flat envelopes. Available from your Industrial Distributor.

*T.M. Applied For

LAMINATED SHIM COMPANY, INC.

SHIM HEADQUARTERS SINCE 1913

Check Our Stampings Division For Your Stamped Parts Requirements

USE COUPON for more information

MAIL TODAY!

LAMINATED SHIM COMPANY, INC.
3111 UNION STREET, GLENBROOK, CONN.

Please send me more information on:
☐ SHIMS ☐ STAMPINGS ☐ BOTH
☐ We'd like to discuss our problem with one of your Sales Engineers.

NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

. . or Released in an Instant

Faster assembly . . . no more failures of fasteners. GREER STOP NUTS hold firm against jolts, shocks, shimmy, wobbles . . . any vibration, any kind.

Bolt threads are gripped tightly . . . these famous nuts *never* work loose. Yet an ordinary hand wrench gives instant release. The tough, built-in GREERCOID collar does it . . . and seals against fluid leakage, too!

Study *your* fastener problem. Over 3000 types and sizes. Consult GREER. Proved on thousands of products. Meets gov't and military specifications.

Write
GREER STOP NUT CO.
2620 Flournoy, Chicago 12, Ill.

ROUND TABLE Discussion

ALCOHOLICS FORALLEVUS

Is it possible to enforce a rule against daily use of alcohol by plant workers? Is it practical, particularly if a man's work is not affected by such use, and enforcement may result in the loss of a good worker? Readers think . . .

WHILE I'M NOT a teetotaler, I will say that there is nothing more disgusting to a decent person than the odor of stale booze wafted to him from another person. The decent person voluntarily moves away. Some men get steeped in booze, and the odor is ever about them, causing obnoxious effluvia, which is sickening.

Al may think that it is impossible to approach Reynolds upon the subject discretely, but it must be done in this way or it may be necessary to bullfrog right into the subject without trying other angles.

Several years back, in a shop in central New York, there was an old souse who always said that water was the only real thirst quencher, but he always wanted his very cold.

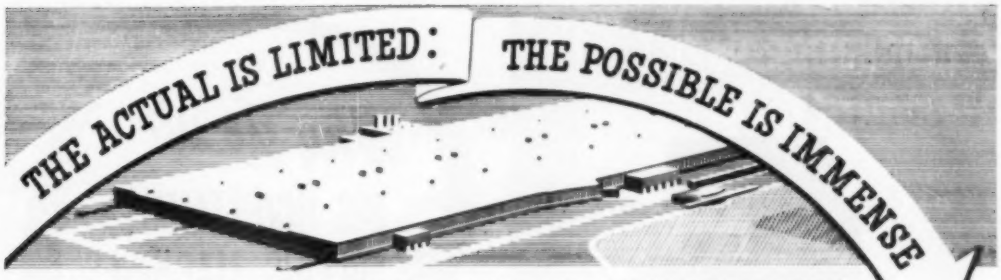
He was a periodic drinker and about every four or five months he would lay off and start on a bender which lasted a week or more. He was a good mechanic and accurate to the last thousandth, so he was able to hold his job. Once he started in the block where the shop was. There was a saloon at each end of the block, and he would walk from one to the other, and at each stop he would have a drink. All of the time he was playing a guitar and singing.

Another time he bought out a peddler's stock of paper pinwheels and put them all out on his small lawn. The revolving color scheme was great, and many came to see it.

Still another time he persisted in climbing a telephone pole. He took a swig from a bottle when he was at the top, and again when he was down, then repeated the performance until fatigue overtook him and he fell down upon the sidewalk, unharmed, and went to sleep there. He still had two bottles with him, both empty. After a week he returned to work.

He was such a good scout that the foreman and some of the other men chipped in and bought some kind of pills which were supposed to overcome the liquor habit. The boys told

SLIT
SLOT
SAW
WITH "THINSAW"
Exclusive Gay-Lee design — the carbide tip with circular seat permits secure tip brazing. Now you can use carbide without worrying about tips breaking loose. Insures long saw life.
CIRCULAR SEAT GIVES GREATER BRAZE AREA — BETTER TIP SUPPORT
NOW UP TO 8" DIA.
5" DIA. AND UNDER, THIN AS .030"
WRITE FOR DATA
Patent applied for
GAY-LEE COMPANY
CLAWSON • MICHIGAN



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1952

WELDED DESIGN SAVES 25% ON COST

...cuts weight 26%

By **B. L. Kapp,** Plant Manager & Chief Engineer
Corson Brothers, Inc.
Indianapolis, Indiana

WELDED design enables us to make the most efficient use of materials in the manufacture of our "Seedmaster". Formerly it was necessary to use heavy wall sections with gray iron because of casting restrictions. With steel we now fabricate a more rigid, more dependable product using metals as light as 12 gauge. On this one machine, for example, weight was cut from 23 to 17 pounds. Since welded steel is easier to fabricate, our shop costs have been lowered by 25%. Former field service problems of breakage have been eliminated.

In addition to components shown in Figures 1 and 2, the main frame was also converted to welded steel. In place of a solid cast rectangular member, the main frame is now formed from 12 gauge steel with rolled edges for rigidity. The steel design is easier to assemble and has greater sales appeal.

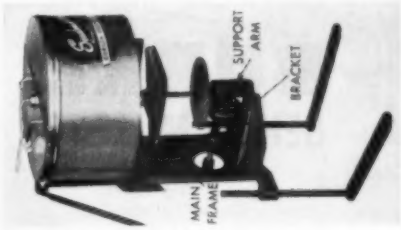


Fig. 4. Present Welded Steel Design. *Steel members replace cast components, prove to be lighter, but stronger in construction yet are formed from 12 gauge sheet.*

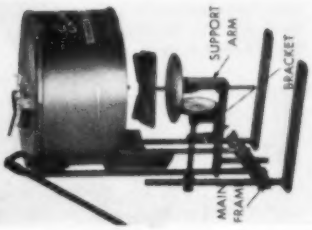


Fig. 3. Original Construction *of "Seedmaster" frame built by Corson Brothers, Inc. Weighed 23 pounds, was subject to fracture.*

PROPER DESIGN IN WELDED STEEL IMPROVES PRODUCT LOWERS COST

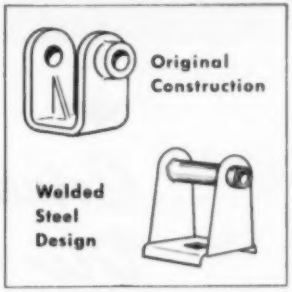


Fig. 1. Former Design *of bracket was gray iron . . . is now fabricated from 12 gauge steel. Steel design is rugged, durable, will not fracture.*

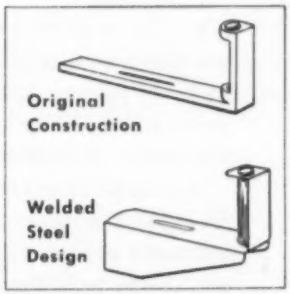


Fig. 2. Support Arm *originally a casting, required costly milling and drilling. Wall section was ½". Is now formed from 12 gauge material, has greater strength, increased rigidity, less weight.*

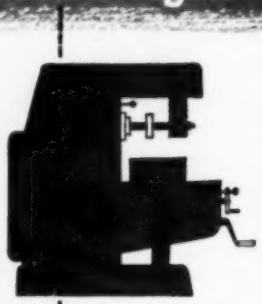
SAVES MATERIAL
LOWERS COST

Machine Design Sheets available on request. Designers and Engineers write on your letterhead to Dept. 1010,

THE LINCOLN ELECTRIC COMPANY
CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

production begins with



Columbus Die-Tool

No tools like the right tools! Columbus Die-Tool designs and builds tools, jigs, fixtures and special machinery to meet your most exacting requirements. RESULTS: operating cost that matches your budget; production that matches your schedule; product quality that matches the demands of your market.

Contact Columbus Die-Tool & Machine Co. first—when you have a special machine problem. They are nationally known as expert designers and builders of special machinery and equipment . . . have been for over 46 years.

Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

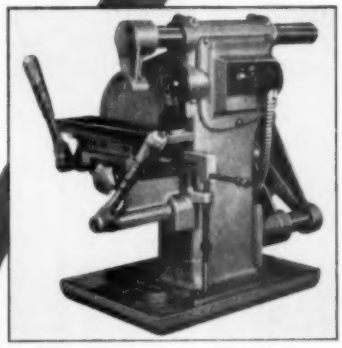
Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

Why tie-up
BIG INVESTMENT
MILLING MACHINES

with work that can be done quicker and easier on

BURKE
BENCH MILLERS

It is amazing how much miscellaneous and production milling can be shifted from large millers to rugged, accurate, economical Burke Bench Millers.



Complete data on hand-feed, power-feed and universal models and attachments sent on request.

Thousands now at work in production lines and tool, repair, development and school shops.

The Burke Machine Tool Co.
A Division of the
U. S.-BURKE MACHINE TOOL CO.
BROTHERTON ROAD 6
CINCINNATI 27, OHIO

him about what they had done and advised him to take them in coffee. They kept an eye on him at lunch-time every day and saw to it that he took his pills.

One noon, at the lunch counter, he said he was getting in a thirsty condition, so they agreed he might take one drink. As he swallowed his whiskey, he turned a wry face to the others and said, "Damn those pills, they make this whiskey taste bad. To hell with them, I'll take the whiskey," and he was not seen for a week at the shop.

We don't know that Reynolds goes off on a spree such as we have mentioned, but he should be taken in hand, and, if no gentle discussion will do any good, Al should take him over the coals, figuratively speaking.

Reynolds should be told what the opinions of others are, and if he continues to annoy them Al should tell him off in no uncertain terms.

If Al does not take some kind of emphatic action, this will be the cause of loss of morale throughout his entire department, for his men may think that he is not man enough to correct the serious fault which this is.

Again, the brass might hear of this affair and Al might be censured by them.

In addition to a stale-booze breath are garlic eating, smoking that class of cigars known as ropes, and rarity of bathing. These are commonly tolerated though many times they are disgusting to workmates. All of them, for decency's sake, should be eliminated.

Al should aspire to a clean lot of men; a clean department and clean language to be required of all.

F. H. Stebbins
Worcester, N. Y.

•

WEARING OFF THE GREEN

Will a little extra time spent on breaking in a new man pay off in the long run? Is it better to gain a man's confidence and ease the strangeness of a new job, or should he be left to himself to catch on gradually?

THERE ARE two fields of thought pertaining to executive technique: one is the soft approach, such as Al suggests, where the boss feels his way around so as to get under the skin of the worker in order to get him to do his best—in other words, to buy him off with kindness. The other is more to my liking wherein the executive plays his part like a man and lays what he has to say on the bar-

You lick many "adverse operating conditions"

when you put **FELT** to work

If your current design problem includes getting top-notch operation in spite of oil or grease, heat or cold, moisture or draught, sun or storm ... **FELTERS FELT** could be the answer to your problem.

Just think of the many problems that can be solved with felt the material that can't rust, won't break, resists a great number of chemicals and acids.

And the beauty of it is that you can get **FELTERS FELT** in any shape, thickness, color or consistency you need.

For more information about felt so hard you can grind it without any fraying or so soft you can wrap it around your finger ... return the coupon to us today.

Fill out and Mail this Coupon TODAY!

The **FELTERS COMPANY**

Manufacturers of Unisorb for Machine Mounting

210-N SOUTH STREET, BOSTON 11, MASS.

Gentlemen: Please send me details on Felters Felt and Felters Precision Cut Felt Parts. I have the following material problem:

.....

.....

Name & Title .....

Company .....

Address .....

City & State .....

PUMPS

FOR COOLANTS, LUBRICANTS, AND ABRASIVE LIQUIDS

PUMPS

POSITIVE DISPLACEMENT AND IMPELLER TYPES

PUMPS

J. I. C. STANDARDS OR DIRECT MOTOR CONNECTED

PUMPS

DEPENDABLE, ECONOMICAL, EFFICIENT

STANDARD OR SPECIAL, FOR EVERY MACHINE TOOL AND INDUSTRIAL USE

Rollway PUMPS

Pioneer PUMP & MANUFACTURING CO., INC.

1965 I JOHN R STREET
DETROIT 3, MICHIGAN

WRITE FOR CATALOG

rel-head with no ifs and ands about it.

One says, "Now here's a little job I would like you to do for me," while the real horny quadruped from the tall timbers makes known his wish in more rugged terms: "Get this out right away." He makes his wishes known in definite words and if they aren't carried out something is going to happen. He takes the stand that he is the director of proceedings. There's no soft-soaping with this guy; he takes his job seriously, and he feels that the only way he can control things is to say his piece in definite terms and see that it is carried out.

One thing is certain: In order for one to take that stand he certainly has to be master of his trade. He must have command of the situation at all times and regardless of his hard-boiled attitude, he commands the respect of his workers. Woe be to the fellow who has a superficial acquaintance with his work and who tries to lord it over his men!

A new man on the job takes over—whether or not he is pretty well up on the know-how, he has to be tactful in dealing with his men—particularly the oldtimers who have spent years in the shop taken over by the new boss. Here is where some of Al's diplomacy comes in for approval. He'd be a sucker to start in with the feeling that he was cock-of-the-walk and the men under him would jump to his bidding.

It is pretty easy to assume what goes on in the minds of some of the men, even though they do look like a bunch of morons to the new boss. Can't you imagine the old planer hand, who has put job after job over the reciprocating platen for a good many years, suddenly stricken with arterial sclerosis when an unknown shop Nero tells him what to do with a job assigned to him! Here is where

"—Report to Mac Donald in the Milling section. Just ask for 'Old Simon Legree'!"

ENGINEERS

TO DESIGN, REDESIGN, OR DEVELOP YOUR PRODUCT

ENGINEERS

TO TOOL AND EQUIP YOUR PLANT FOR THE BEST PRODUCTION ECONOMICS

ENGINEERS

TO GET YOUR NEW PRODUCTION GOING AND KEEP IT GOING

ENGINEERS

TO REDUCE YOUR COSTS AND IMPROVE YOUR QUALITY

ENGINEERS, DESIGNERS, CONSULTANTS AND PRODUCTION SPECIALISTS

PIONEER ENGINEERING & MANUFACTURING CO., INC.

1965 I JOHN R STREET
DETROIT 3, MICHIGAN

INQUIRIES PROMPTLY ANSWERED

it is incumbent upon the new boss to look up to the experienced operator and take kindly to his suggestions and advice.

If Al were a new man starting in on the job, I'd say that his scheme was one of the most tactful ones ever conceived by man. A new boss should be as tactful as a politician seeking office when the opposition has the goods on him, as hard-boiled as a 10-minute egg, and as versatile as a 00 B&S automatic screw machine.

Al says he's breaking down the barrier between himself and his men so that they can see eye to eye. There's only one eye—the eye of efficient direction that sees the way out to efficient production.

Jack Everett

San Francisco, Calif

•

NEW IDEAS? If we didn't, get new ideas from some one, the world would be at a standstill, no matter if that person is from Portland or Timbuktu.

Certain it may be that the person from whom we learned the ideas, may have, in turn, learned them from another party, but what's the difference so long as we get new ideas and will make progress with them in our work.

In considering the two men, Al and Ed, we wonder if Ed rules his men like a czar as he would make us believe according to his remarks to Al.

The time was when tramp draftsmen, machinists, printers, etc., were the best in their respective lines and it is largely so at this time; many a foreman has learned good ideas from some of them which he used to advantage.

So expert were some of these men that they would not take much in the way of lip from any foreman. They would leave the job if such a thing occurred.

Ed, according to his own lights, has done much on this orb of ours. We wonder if he ever went over Niagara Falls in a barrel.

Coming back to earth, the government elucidates that there are 23,559 different ways of making a living, and it would be strange indeed if an occasional improvement could not be made in one or more of these methods.

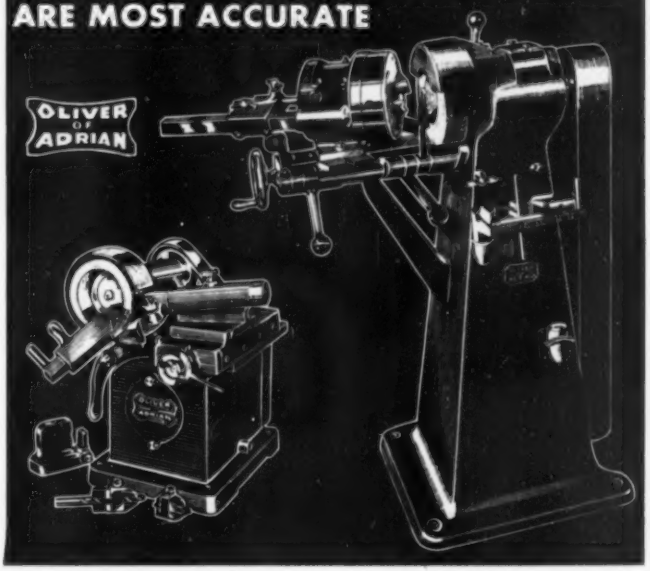
Elias Howe, the inventor of the sewing machine, worked a long time to make a needle which would work in it and was making no progress when his wife told him that he has the eye of the needle in the wrong

FAMED for PRECISION

NAVY GUN POINTERS ARE MOST ACCURATE

The huge battlewagons and aircraft carriers of the United States Navy, along with its cruisers, destroyers, and other component parts of the Fleet, form this country's traditional first line of defense. The fire power of the Fleet is world famed for its precision and accuracy due to the excellent training of the Fleet's gun pointers, augmented to the nth degree by marvelous range finding and fire control equipment.

OLIVER DRILL POINTERS ARE MOST ACCURATE



Maintain the precision and accuracy of the drills in your toolroom. Avoid costly production slowdowns. Those due to excessive drill costs and imperfect holes can easily be traced to improper grinding of the drill points. It is a proved and generally accepted fact that machine grinding is the most accurate method for restoring efficiency to drills. Oliver Drill Pointers give balanced cut, with each lip doing equal work. Drills will cut faster, last longer and produce more accurate holes when machine ground on Oliver Drill Pointers.

No. 510 for drills ¼" to 3"—2-3-4 flute. Variable clearances Variable point angles. Full automatic operation.

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½". Right hand, with an improved point. Attachments are available for grinding oil hole drills, left hand and other special points.

Write for our free Booklet "How To Produce More Holes With Your Drills!"

OLIVER INSTRUMENT CO.

1414 E. MAUMEE • ADRIAN, MICHIGAN

it's down to
BRASS TACKS

KENNAMETAL
"IN-PLANT" TRAINING
program on carbide tooling

No frills or fuss in the Kennametal "In-Plant" Training Program. We show your men how to select the right carbide tool for the job, use it properly, and resharpen it correctly; as well as how to simplify tool stocks and smooth out kinks in operating routines.

This program is practical — not academic; not theoretical. In your own plant it applies the on-the-job "know-how" of our field organization — and this experience is greater than that of any other carbide tool manufacturer.

The objective of Kennametal's "brass-tacks" program is to help you get top performance from a tool material that's *made* to give you more production in less time, at less cost. Ask our nearest field engineer for the facts. Kennametal Inc., Latrobe, Pa.

KENNAMETAL
CEMENTED CARBIDE TOOLING
THAT INCREASES PRODUCTIVITY

end. She made the improvement, and this act of hers made the whole outfit click.

A man who starts work in a new place, never knows what he is going to be up against.

He can only hope that the other men in the new department will meet him halfway. If they are cordial and pleasant, very naturally he is pleased, but if they sneer at and snub him, the opposite is true.

A few years back, the writer had occasion to call upon a small plant conducted by three brothers. They employed about 70 men and 12 women and made the very best product in their line.

The railroad station was seven miles away and the man who drove me to the plant explained that the three men were worth about a half million dollars each and that they owned every building (about sixty) in the village.

One might expect to find a lot of "bulls" as Ed implies he is. These would be hard-hearted grouches who would squeeze every man until he couldn't wriggle his fingers, but there was a surprise in store.

At that time, World War II was on, and the government was making contracts left and right. Upon my inquiry if they had a government contract, the reply was "No," because they didn't care to have a lot of incompetent inspectors around.

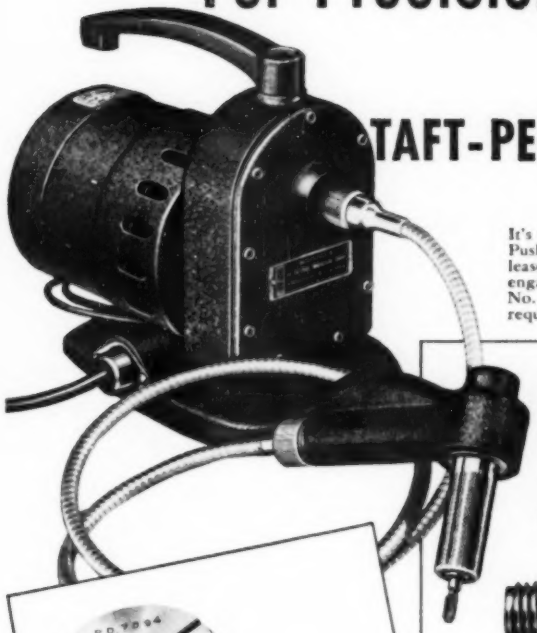
Upon asking about taking on men, one of the brothers replied that they had taken on several during the last twenty years but that before they went to work, the brothers had each man become thoroughly acquainted with them and so learned if they all were going to like each other. This took about three or four days around the plant, and then an evening or two in their own homes.

(*Continued on page 237*)

"A-A-A-Choo-O-O-O!"

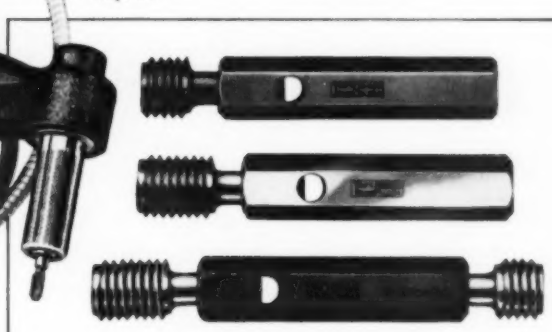
For Precision *Plus* Economy

SPECIFY
TAFT-PEIRCE THREAD GAGES



T-P ROTOCHEK.

It's the fastest thread gaging method yet devised. Push — and the gage screws into the work. Release the pressure and it stops. Pull — and it disengages. Accommodates A.G.D. tapers No. 00, No. 0, No. 1, No. 2, and No. 3. Special sizes on request.

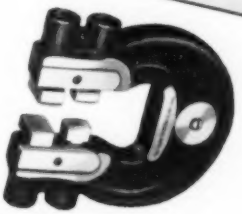


T-P LIMIT THREAD PLUG GAGES

Special heat treatment locks-in precision . . . provides miles more gaging service. Removable thread ends save on replacement. Available in Taper Lock or Reversible standard sizes. Steel or Tungsten Carbide.

T-P THREAD RING GAGES

Single unit clamping device simplifies setting . . . eliminates possibility of distortion . . . increases accurate gaging life. Available in standard sizes.



T-P ADJUSTABLE SNAP THREAD GAGES

Faster to operate than ring gages, they feature *complete thread* inspection . . . rigid mounting . . . maximum range of adjustment. Available in standard sizes with Steel or Tungsten Carbide Anvils.

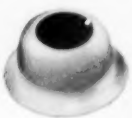
For the complete story on these items and many more, get your copy of the new Taft-Peirce Handbook.

The TAFT-PEIRCE Manufacturing Co.

WOONSOCKET, RHODE ISLAND

T-P means Top Precision

PREFORM



PIERCE, TRIM AND BLANK

EDGE

Here's what you can do by

Hydroforming

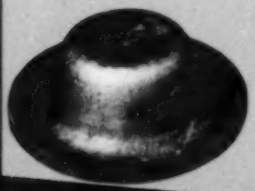
HOLD CLOSE TOLERANCES

SANDWICH

Cover of 0.064" 2SO Aluminum. Hydroformed in 2 operations.

Strainer of 20 gage perforated cold rolled steel. Hydroformed in 1 operation.

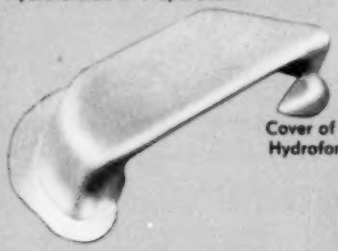
Cover of 0.040" 3SO Aluminum. Hydroformed in 1 operation.



Cap of ⅜" cold rolled steel. Hydroformed in 1 operation.

Angle assembly of 0.075" Aluminum. Hydroformed in 1 operation.

Aircraft detail of 0.040" Aluminum. Hydroformed in 1 operation.



Cover of 0.032" Aluminum. Hydroformed in 1 operation.

Vessel of ¼" cold rolled steel Hydroformed in 1 operation.

PRODUCE DEEP DRAWN PARTS WITH VERY FEW LIMITATIONS AS TO SHAPE

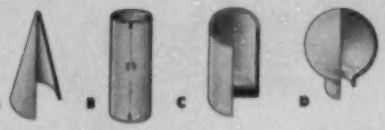
Hydroforming has revolutionized deep drawing. The parts and forming operations illustrated on the opposite page show the extreme versatility of this process. Note the wide variations in part shape. Note, too, that Hydroforming is *not* confined simply to the production of round or symmetrical parts.

WORK WITH A WIDE RANGE OF MATERIALS

Parts can be Hydroformed of steel, aluminum, magnesium, copper, aluminized steel, brass, plastics, insulating materials and precious metals. High-strength alloys successfully Hydroformed include titanium, Inconel, Nimonic 75, L-605, stainless steels, stainless-clad copper.

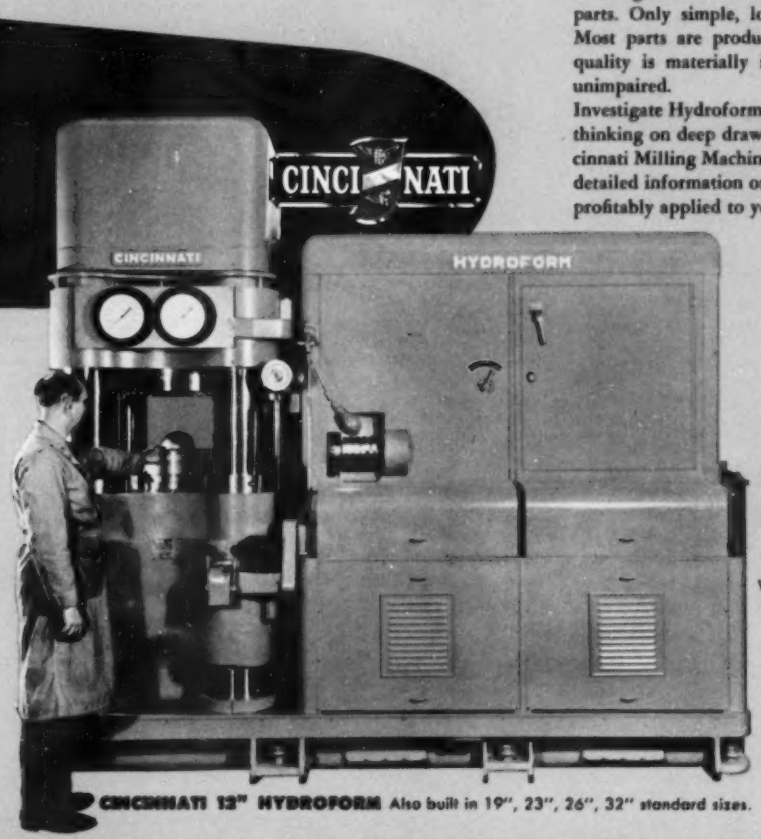
Blank thickness can range from foils to 3/8" mild steel. Blanks ranging up to 32" maximum diameter can be drawn in standard machines. Larger equipment available on application.

There are several basic shapes that cannot be practically Hydroformed. It is not practical to form sharp, pointed conical shapes (Fig. A). Straight-walled cup shapes having a depth to diameter ratio of 2½ or more to 1 are not practical to form (Fig. B). Parts similar to shell casings which have a relatively thin wall as compared to a thicker closed end cannot be Hydroformed (Fig. C). Bulged parts having a small opening are impractical to form. Parts of this type with a large opening can be made using a segmented punch for removal after forming (Fig. D).



With the few exceptions noted above, practically *any shape* can be Hydroformed. In addition, Hydroforming brings to industry many other benefits affecting the time and cost of producing deep drawn parts. Only simple, low-cost tooling is required. Most parts are produced in a single draw. Part quality is materially improved. Surface finish is unimpaired.

Investigate Hydroforming now. It will change your thinking on deep drawing and forming. Let a Cincinnati Milling Machine Co. field engineer give you detailed information on how Hydroforming can be profitably applied to your production.



Write for your copy of Hydroform Bulletin M-1759

CINCINNATI 12" HYDROFORM Also built in 19", 23", 26", 32" standard sizes.

Hydroform

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO

Why Burn Down Your House for Roast Pig?

IN ancient China, men ate meat raw. But one day, while Ho-ti the swineherd gathered mast for his hogs, his stupid son Bo-bo, playing with fire, burned down their straw hut. Bo-bo sniffed the odor of burnt pig. He touched one to see if it was still alive, scorched his fingers, put them in his mouth and was amazed at the delicious taste. Father came home and caught his son devouring a pig. Ho-ti tried one, too, found it intoxicatingly sweet and satisfying.

Thereafter, neighbors observed feverish building of new straw huts at Ho-ti's, followed always by conflagrations. The secret leaked and fires became widespread. In a few weeks even his Lordship's town house was on fire. Finally, straw for hut building disappeared from the market and young pigs could not be had for love or money. At last, after many generations, a wise man arose who said that a pig could be roasted without burning down an entire house.

Thousands of years later, we Americans feast deliriously on "roast pig." Accompanying our delights are fires of inflation, which can destroy our values just as certainly as the roasting of Ho-ti's pigs consumed his earthly possessions. But surely we need not await the coming of a sage to tell us not to burn down our houses to enjoy the delights of roast pig!

Let us unite to stop the ruinous flames of inflation. Curb wasteful and unnecessary government spending. Balance our Federal budget. Control our national debt and reduce taxes. Only in this sane way can we produce more straw and enjoy our houses, raise more pigs and eat them, too.

QUALITY YOUNGSTOWN SERVICE

The Youngstown Sheet and Tube Company

General Offices -- Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

RAILROAD TRACK SPIKES - CONDUIT - HOT AND COLD FINISHED CARBON AND ALLOY BARS - PIPE AND TUBULAR PRODUCTS - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RODS - SHEETS - PLATES.

In other words, they were doing far more extensively just what Al is attempting to do. They said they very seldom had a man leave them and never with a bad taste in his mouth.

Later, my driver told me that at that time three generations of some families were employed there; that ten dollars per month was the maximum rental of a house and that all kinds of family supplies were sold very nearly at cost at the village store, owned, of course, by the brothers.

Any one of the three frequently shod the horses of the farmers living in the surrounding country.

Now, my point is that all were treated alike and all were on the same level at the plant or in the village. Does anyone suppose that there were any men who were not at ease with all the others, just as Al would like it? They were a family of friends and neighbors and there they applied this to the shop as well as anywhere.

True, this is an extreme case, but the principle of it is about the same as that under Al's consideration.

The oldtime foreman, and Ed seems to be one of the same stripe, generally didn't care a thimble-full of birdseed as to how a new man felt. The latter dug for himself, no matter whose grave it was, but today, the brass is found to be just as human as the rest of us, and no man need fear any of them, so he is at liberty to be every inch a man.

Ed is wrong, while Al tries to promote Christianity.

Robert Lee Graylord
Worcester, NY

•

No ONE BUT a person with a poor sense of values would buy an unknown machine and not do some checking to determine its worth.

"Remember the apprentice days and the first time you were sent for an 'old man'?"

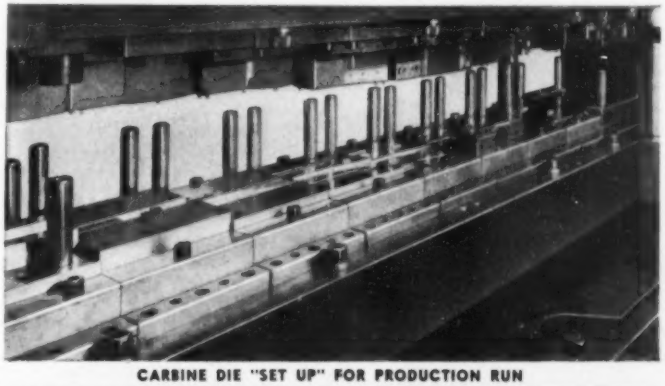
B. Jahn PRODUCTION PROVED DIES

speed carbine magazines from—

Production line to Battle line

with new efficiency and economy!

Another evidence of B. Jahn versatility and ingenuity is this mammoth progressive die—one of the largest of its kind ever built! Measuring over six feet in length, this vital defense tool produces *40* carbine magazines per minute—each identical! Each perfect! Each an example of flawless "proving ground" accuracy!



CARBINE DIE "SET UP" FOR PRODUCTION RUN

CARBINE DIE RIBBON SUBMITTED FOR CUSTOMER APPROVAL

THIS—LIKE EVERY B. JAHN BUILT DIE—WAS PRODUCTION PROVED TO ELIMINATE ALL ERROR, ALL CHANCE, ALL UNCERTAINTY AND TO GUARANTEE A FINER DIE PRODUCT!

In B. Jahn's modern plant, presses run 10 to 50,000 parts for customer's actual assembly line use *before the die is certified PRODUCTION PROVED and shipped!* B. Jahn's guarantee: *the die must work in the customer's equipment to his unqualified satisfaction!*

SEND TODAY for the "Story of B. Jahn PRODUCTION PROVED DIES!"

PRODUCTION B. Jahn PROVED

B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

Check Nut
This is a VLIER Torque Thumb Screw
A trouble-free holding tool that properly supports work pieces against machine tool pressures and automatically prevents their distortion due to overtightening. This assures you of precision machining of even fragile parts.
It Works Like This...
The free-rotating head contains a ball check that works against accurately controlled spring pressures. Upon arriving at the pre-determined holding pressure, the head rotates freely and prevents overtightening of the screw. "Tight is tight enough!"
And These Are the Mechanical Details
Body thread is National Coarse Series Class No. 1 fit. Check nut provided on most sizes prevents backing off under chatter. Holding pressures range from 0-50 lbs. Accuracy and uniformity guaranteed. Made of hardened and rust-proof selected steels. Nothing to wear or break.
Available in Four Types
1. Regular—Type A—for normal supporting.
2. Inverted—Type B—Reverse of Type A support.
3. Tee Head—Type C—used with sliding V-Blocks.
4. Adjustable—Type D—set your own holding pressures.
There is a nearby Vlier distributor to serve you. Write today for Catalog No. 51 which includes Spring Plungers, Spring Stops, Fixture Keys and Toggle Pads.
VLIER
VLIER MANUFACTURING COMPANY
4552 Beverly Boulevard, Los Angeles 4, California

A new man is an unknown and is entitled to be understood and encouraged. If there is ever a time in a man's life when he needs understanding and encouragement, it is when he starts out on a new job. Some fellows are inured to withstand the rigors of the first day, but the average man always heaves a sigh of profound relief when the quitting bell rings at the end. Some start in with goose pimples while others carry on with the feeling, "If they don't like my work they can go to. . . ."

Usually the new man goes home with a feeling of happiness that he weathered through the first line of breakers, and as he puts his arm around his wife's shoulder undoubtedly says, "Well, Bess, I've broken the ice."

What Bill meant was that he had weathered the long, first day. In all likelihood, Bill had been given a job by his new boss and had spent the day on it to his own satisfaction.

"How'd you get along with the boss?" Bess inquires as she proceeds with the supper.

"All right, I s'pose," Bill comes back, looking over his shoulder as he hangs up his coat; "Didn't get to have any words with him though, other than to acknowledge the instructions about the job he gave me."

"Then you don't know what he thinks of you!" she frowns.

The boss had been busy throughout the day and hadn't gotten around to have a talk with Bill, which naturally left the man up in the air as to knowing how he rated with the new boss.

This is not good. While a man cannot be appraised to any degree by one day's work, he should have at least the satisfaction of knowing that there was a bond of understanding between him and his new foreman. It doesn't take very long for an executive to size up the worth of a new man by observation—that is, how he goes about his work.

This, however, isn't enough to de-

"Orders from the front office to display the company calendar only."

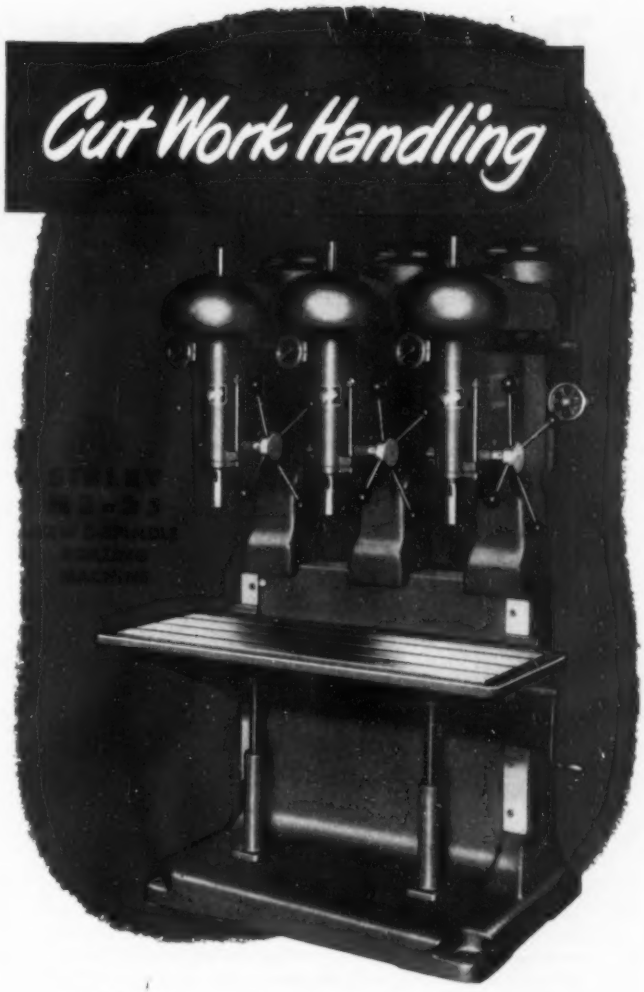
termine the real worth of an employee who comes in as an unknown. There is a motivating force— a potential directive — within each worker, that needs checking into. The man's sense of fair play should be understood. Is he out for all he can get regardless of the outcome, or does he take into consideration the welfare of his shopmates and his employer? These are things which the alert foreman should be able to spot. The new man should be made to feel that he is a human being and not a cold machine without any sense of feeling.

Interest in the man's welfare should be disclosed on his first day at work, if at all possible. The foreman should make it known to him that he, the foreman, looks toward a successful future in that there should be cooperation and harmony between them. He should manifest an interest in the man's family. This strokes his hair the right way and makes him feel that his interests are being looked into unselfishly.

There undoubtedly are many of Ed's makeup who consider the time spent in personal contact as being a mere waste. The foreman should have sufficient time on his hands to take care of such things. Being burdened down with details will only detract from his best efforts. If the men see that their boss has a personal interest in them, you can depend upon it that in times of stress he will be able to depend upon them for their sympathetic support.

I've had foremen who managed an excuse for a smile upon reporting to them for job assignment on the first day, and then left me to find my way around the shop to accomplish my work by whatever means I could find. This is not good business.

I can still look back, with a great feeling of joy, on one particular foreman who greeted me with a sincere smile; took me around the shop and made me acquainted with the other fellows; pointed out the various pieces of equipment which I would be using; then, after giving me my first piece of work, put his hand on my shoulder and told me to start in easy till I got the swing of things. Shortly before noon he invited me to have lunch with him in his office (I brought my own ducks). During those few minutes we automatically removed any barrier that might have come up in the future. Right at the start I knew I had a friend in that fellow; he made it very evident that I was the main concern—not the work I was to do. He figured that if I were made to feel at home



Work-handling consumes more time than work-cutting in producing many jobs. Reducing manual effort by one-half may increase production more than by faster cutting speeds. To make this improvement without burdening the operator —in fact to make it easier for him—is the chief advantage of the new Sibley Model ME-25.

The variable speed drive, the big 21½" swing, the extra large table, the convenient speed controls, the handy tachometers, all combine to make this 1" capacity, medium weight machine a production advantage in any shop!

SIBLEY

SIBLEY MACHINE & FOUNDRY CORP.
Dept. AM-10, South Bend 23, Indiana
Send Catalog No. 70.

Name _____ Title _____
Company _____
Address _____
City _____ State _____

The U. S. Steel Supply team

that gives you

personalized service

Our *telephone salesman* is your "on-the-spot" assistant!

OUR telephone salesmen are trained to look at your business from *your* viewpoint. They are your "on-the-spot" assistants in our organization. When you want steel or supplies, or need information quickly about availabilities, priorities or prices, pick up your phone and call one of our salesmen. He is in a position to turn your inquiry into immediate action, and to follow it through, if necessary, until you receive the steel or the information you want.

Most of our customers call their telephone salesman, because it suits their convenience to place their orders or inquiries by phone. It gets their steel buying done fast! Whatever your reason for contacting one of our telephone salesmen, you'll find that your business is handled promptly, intelligently, courteously and with the personal interest that marks every member of the U. S. Steel Supply team.

YOUR "ONE CALL" SOURCE OF STEEL SERVICE

U. S. STEEL SUPPLY

UNITED STATES STEEL SUPPLY DIVISION, UNITED STATES STEEL COMPANY
HEADQUARTERS: 208 So. LA SALLE ST., CHICAGO 4, ILL. · WAREHOUSES COAST-TO-COAST
Warehouses and Sales Offices: BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE
MOLINE, ILL. · NEWARK · PITTSBURGH · PORTLAND, ORE. · ST. LOUIS · TWIN CITY (ST. PAUL)
SAN FRANCISCO · SEATTLE
Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · PHOENIX
ROCKFORD, ILL. · SALT LAKE CITY · SOUTH BEND · TOLEDO · TULSA · YOUNGSTOWN

USS

UNITED STATES STEEL

in his shop that the work would take care of itself.

It is better to wear off the green by showing consideration to the new man than to ignore his interests at the start and let glow with the shades of the setting sun at some later date.

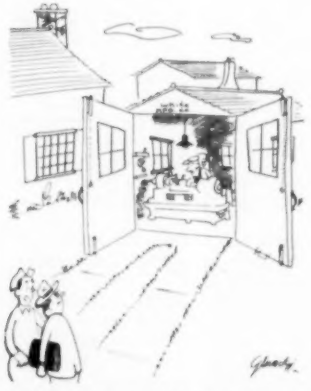
J Homewood
Ontario, Calif

•

THE ATTAINMENT of increased efficiency, lower costs and better quality of product in a shop involves the skillful and sympathetic handling of men as well as the skillful handling of materials and machines. In line with laudable endeavor, converting new employees from strangers to friendly, loyal, and efficient workers should be the aim of all foremen and management. Integrating the newcomers into the shop working-force involves adequately informing them about their jobs, the company that employs them, their importance to the welfare of the group, and the foreman's importance to them. It is to the interest of the foreman and management to see to it that they start out on the right track without delay.

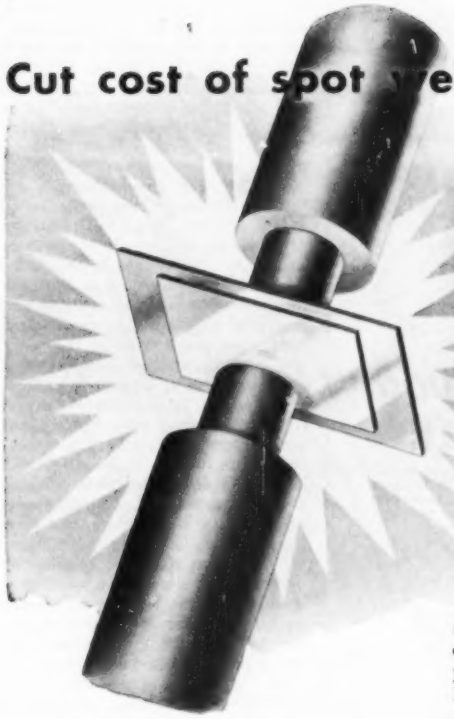
The first thing the foreman should do is to set up a strong chain of communication with his new employees. To do this, he should have a detailed program for converting new workers from strangers to friends; an important factor in any shop is human beings. The new man deserves the constant effort, day by day, of the foreman, in skillfully wearing off the green to develop a loyal and efficient worker.

Too much emphasis cannot be placed on the importance of carefully



"We're dickering for a big government contract—if that comes through we're gonna rent a two-car garage."

Cut cost of spot welding stainless steel . . . with MALLORY 100 METAL FLUTED ELECTRODES*



If you're spot welding stainless or other high strength steels—or any alloys having relatively high electrical resistance—you'll get more welds per dollar with fluted electrodes of Mallory 100 alloy. Outstanding features of these electrodes are:

1. **Fluted water cooling hole:** Provides 70% more heat transfer area for cooling water. An exclusive Mallory design now produced in Mallory 100 metal electrodes through new manufacturing techniques.
2. **High hardness and strength:** The higher hardness and strength of Mallory 100 metals coupled with excellent abrasion resistance and high annealing temperature, provide the ideal electrode for spot welding stainless steel, Inconel and other high-strength, heat-resisting alloys.
3. **Maximum electrode life:** Mallory 100 fluted electrodes produce the maximum number of welds of good strength, quality and consistency per dressing. By reason of the high strength and hardness of the electrode material and the most efficient design for cooling, the deformation of the welding face is held to a minimum.

Fluted electrodes of Mallory 100 are available in all standard shapes, and can be supplied in special forms to meet your individual requirements. For full details, call Mallory today, or contact your local distributor.

Behind every MALLORY Product . . .

. . . stand more than 25 years of metallurgical development and application experience in all types of resistance welding. This wealth of engineering knowledge is at your service, ready to work on your welding problems.

For low-cost, high-production welding, look to Mallory for electrodes, holders, dies, castings, forgings, rods and bars.

*Trade Mark, Patent Pending

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario.

P. R. MALLORY & CO. Inc.
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Dry Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P. R. MALLORY & CO., INC., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

This is the SIGN of your

BEST-BUY LINE

—and it marks your BEST source of Materials Handling Service—Service that encompasses Technical Counsel, Plant Surveys, Operator Training and Engineering as well as expert Maintenance and Repairs. Look with confidence to CLARK's nation wide organization of Authorized Sales and Service Dealers.

ALABAMA: BIRMINGHAM
M-H Equipment Company
ARIZONA: PHOENIX
Robert H. Braun Company
ARKANSAS: LITTLE ROCK
Bigelow Robinson Co.
BRITISH COLUMBIA: VANCOUVER
National Machinery Company, Ltd.
CALIFORNIA: FRESNO 1
Robert H. Braun Company
CALIFORNIA: LOS ANGELES 22
Robert H. Braun Company
CALIFORNIA: OAKLAND 3
Glen L. Codman Co., Inc.
COLORADO: DENVER
J. M. Meade
CONNECTICUT: NEW HAVEN 15
C. E. Reutter Corporation
DIST. OF COLUMBIA: WASHINGTON
Fallsway Spring & Equipment Co.
FLORIDA: JACKSONVILLE
Whitmore Industrial Trucks
FLORIDA: MIAMI
EquipCo, Inc.
FLORIDA: TAMPA
Whitmore Industrial Trucks
ILLINOIS: CHICAGO 4
Modern Handling Equipment, Inc.
INDIANA: EVANSVILLE 13
W. A. Marschke & Sons, Inc.
INDIANA: INDIANAPOLIS 5
W. A. Marschke & Sons, Inc.
INDIANA: SOUTH BEND 14
Materials Handling Equipment Corp.
IOWA: DAVENPORT
Big River Equipment Company, Inc.
IOWA: DES MOINES
Big River Equipment Company, Inc.
KENTUCKY: LOUISVILLE 7
W. A. Marschke & Sons, Inc.
LOUISIANA: NEW ORLEANS
Industrial Truck & Caster Co., Inc.
MAINE: PORTLAND
Brodie Industrial Trucks, Inc.
MANITOBA: WINNIPEG
J. H. Ryder Machinery Co., Ltd.
MARYLAND: BALTIMORE 6
Fallsway Spring & Equipment Co.
MASSACHUSETTS: BOSTON (Malden 48)
Brodie Industrial Trucks, Inc.
MICHIGAN: DETROIT 2
Material Handling Sales Corp.
MICHIGAN: GRAND RAPIDS
Material Handling Sales Corp.
MINNESOTA: MINNEAPOLIS 7
Material Handling Engineers
MISSOURI: KANSAS CITY 8
Lift Truck Sales & Service, Inc.
MISSOURI: ST. LOUIS 8
Materials Handling Equipment Corp.
NEW JERSEY: UNION
Hull Equipment Co.
NEW YORK: ALBANY
Rushmore, Weber & Case, Inc.
NEW YORK: BUFFALO 2
Brodie Industrial Trucks, Inc.
NEW YORK: NEW YORK 14
Bond Industrial Equip. Sales Co., Inc.
NEW YORK: SYRACUSE 2
Brodie Industrial Trucks, Inc.
NORTH CAROLINA: GREENSBORO
Industrial Truck Sales & Service Co.
NORTH DAKOTA: FARGO
Sweeney Brothers Tractor Co.
OHIO: CINCINNATI 15
Robert C. Young & Co.
OHIO: CLEVELAND 11
Material Handling Equipment Corp.
OHIO: COLUMBUS
Edward J. Sherry Co.
OHIO: TOLEDO 4
Kern Truck Sales, Inc.
OKLAHOMA: TULSA 6
Arst Equipment Company
ONTARIO: FT. WILLIAM
J. H. Ryder Machinery Co., Ltd.
ONTARIO: TORONTO 5
J. H. Ryder Machinery Co., Ltd.
ONTARIO: WINDSOR
J. H. Ryder Machinery Co., Ltd.
OREGON: EUGENE
Preston Faller
OREGON: PORTLAND 5
Preston Faller
PENNSYLVANIA: HARRISBURG
Furnival Machinery Co.
PENNSYLVANIA: PHILADELPHIA
Furnival Machinery Co.
PENNSYLVANIA: PITTSBURGH 33
Material Handling, Inc.
QUEBEC: MONTREAL 9
J. H. Ryder Machinery Co., Reg.
SOUTH CAROLINA: COLUMBIA
Lukas Equipment Co.
SOUTH DAKOTA: SIOUX FALLS
Stan Houston Equipment
TENNESSEE: KNOXVILLE
Dempster Bros., Inc. (I.T.D.)
TENNESSEE: MEMPHIS
Prod J. Vandemark Co.
TERRITORY OF HAWAII: HONOLULU
Pressed Steel Car Co., Inc.
TEXAS: DALLAS
T. G. Frazee
TEXAS: HOUSTON 25
T. G. Frazee
UTAH: SALT LAKE CITY
Albert J. Isaacson Company, Inc.
VIRGINIA: NORFOLK
Wilson Industrial Equipment, Inc.
WASHINGTON: SEATTLE
Preston Faller
WASHINGTON: SPOKANE
Preston Faller
WISCONSIN: GREEN BAY
Wisconsin Industrial Truck Co., Inc.
WISCONSIN: MILWAUKEE 10
Wisconsin Industrial Truck Co., Inc.

In the Yellow Pages of your phone book, you will find your nearby CLARK dealer listed under "Trucks—Industrial"

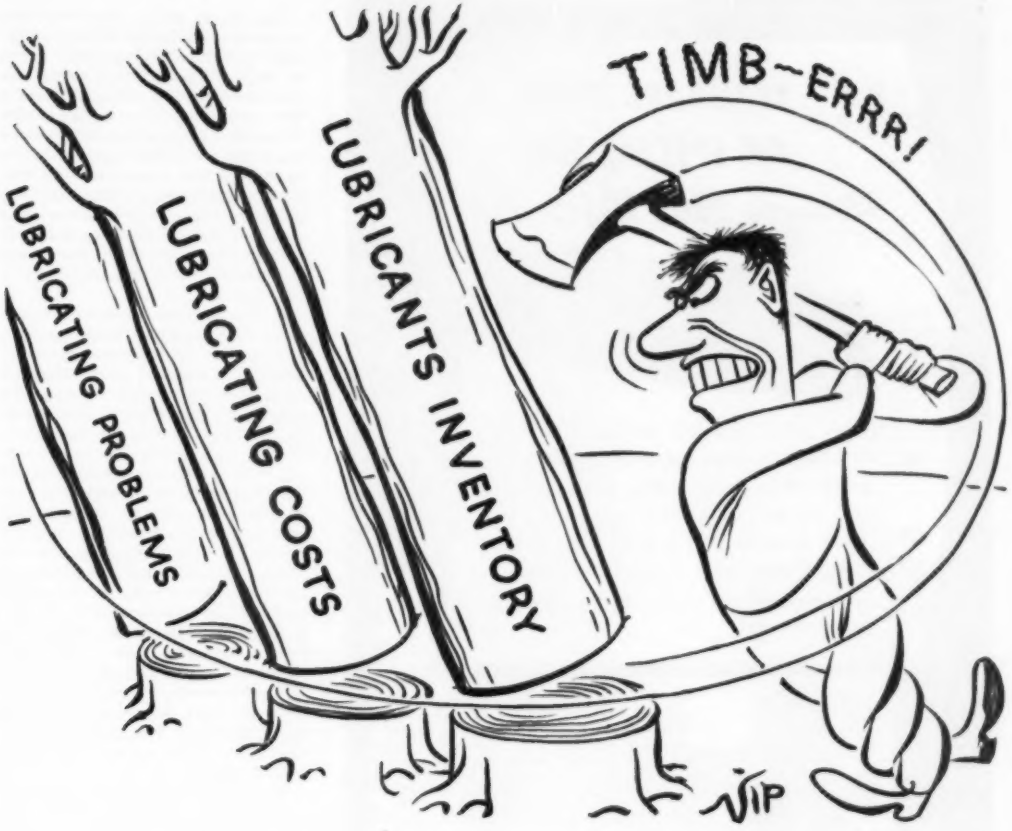
INDUSTRIAL TRUCK DIVISION
CLARK EQUIPMENT COMPANY
BATTLE CREEK, MICHIGAN

introducing and indoctrinating a new employee to the job. The most essential part of the induction process is the responsibility of the foreman. Careful attention to this function will repay the foreman many times because he obtains the respect, confidence, and good will of the new man.

The foreman should have a detailed program for the induction of a new worker. A typical induction program should include the following items: The new man should be told briefly about his job. Skill requirements should be outlined and the new employee given a clear picture of the nature of the work which he is expected to do. At this point also, the broad aspects of company policies should be explained. He should be given information about occupational matters such as opportunities in the job, location of tools, stock, and equipment, safe working methods, importance of keeping costs and waste to a minimum, and good housekeeping practices. In addition, he should be given information on personal matters such as location of washrooms, lockers, emergency equipment, punctuality, disciplinary measures, attitudes on cooperation, and where to seek information.

On the matter of whether or not a foreman is justified in spending time on a new man at the expense of neglecting the older and more experienced employees, I believe that the additional time spent on the newcomer is well justified, with little or no detrimental effect on the older employees. When the foreman does the breaking in and training of the new man, responsibility for efficiency in his department is placed directly on his shoulders. The foreman has a good chance to judge the abilities and possibilities of the new man from the job-performance standpoint.

"Now, don't give me that excuse that your rooster had a tough night and couldn't get up to crow and wake you this morning!"



You can do it, too . . . with Pure Oil Industrial Lubricants

At one fell swoop, you can cut your inventory . . . cut your costs . . . cut your problems . . . with Pure Oil's complete line of industrial lubricants.

Many of these top-quality oils and greases, you see, are designed to do several *different* jobs instead of one specific job.

And to do each job *equally well.*

This enables you to do *all* your lubricating with *fewer* lubricants. In other words, you can

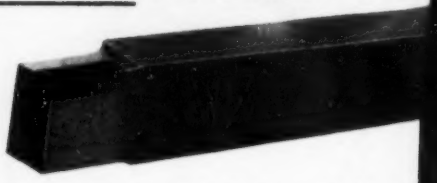
simplify and save . . . with Pure Oil Industrial Lubricants

If you would like to swing a sharp axe on *your* lubricating costs (and who wouldn't, things being what they are!) write: The Pure Oil Company, Industrial Sales, 35 E. Wacker Drive, Chicago 1, Illinois.

THE PURE OIL PURE COMPANY, U.S.A.

Be sure with Pure

STANDARD TOOL ON SPECIAL JOB *Reduces* TOOL COSTS 65%



Here's what happened during an inside threading operation at an atomic special project. A special carbide cutting tool was being used for the job, which requires a No. 10 Acme thread in steel S. A. E. 1030. Everything went wrong, however. Tools were breaking, and the result was not one piece was completed.

Mr. Howard G. Frisby, Jr., representative of Choctaw, Inc., Memphis, came to the rescue. He furnished a Wendt-Sonis standard AR style carbide tool bit, turned it up sideways and reground it on the job. Breakage was eliminated, the job finished and tool costs reduced 65%.

YOUR CHOICE OF CARBIDE

When you choose Wendt-Sonis, you select the brand and type of carbide you want. You also select from a complete range of Wendt-Sonis standard tool sizes. All Wendt-Sonis carbide-tipped tools have rust-resistant tool shanks made from highest quality steels for greater economy and faster production.

Free! **CHIP BREAKER CHART**

Contains illustrations of chip-breakers, grinding instructions and recommendations for their use. Chart size with tab for wall hanging. Write: WENDT-SONIS COMPANY, Hannibal Mo.

WENDT SONIS

HANNIBAL, MISSOURI

580 N. Prairie Ave., Hawthorne, Calif. — 549 West Randolph St., Chicago, Ill.

CARBIDE-TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL TOOLS

Significant too is the fact that the foreman is forced to keep up-to-date with the latest methods when he is responsibile for training the new man. Here a separate training staff is avoided. The foreman who trains others equips himself for more important jobs. The foreman is the one who is best able to see to it that the newcomer gets a correct first impression of his new job. A man who does not receive this impression is very apt to start off on the wrong foot, soon lose interest, and his goodwill is lost.

In order to make certain that time spent in adequately breaking in a new worker will not prove too costly from the standpoint of the foreman neglecting his regular duties and supervising his regular employees, he should try to plan his day's work so that all of his duties can be met. It is believed that with careful planning the foreman can take care of indoctrinating new workers and still be able to attend to his regular duties. He still should find time to teach old employees new methods as they are developed. However, training the new man should have precedence. Most of the men a firm loses are the new ones; it seems that the green never wears off before they quit. It is costly to train new men. Why not save time and trouble in the long run by devoting that extra time in the breaking-in stage of the new worker?

New workers must be taught to do their jobs correctly from the outset. Those who fail at one task can often be salvaged for another.

Tangible results of personal attention by the foreman to the induction

"... You know, J. B., our product brings in more money if it's sold as scrap!"

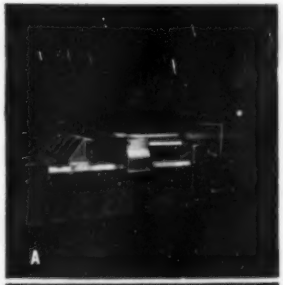
of the new worker include reduction in labor turnover, less spoiled work, less damage to material and equipment, and improvements in quality and quantity of product. Perhaps above all, good will is generated. When employees feel that they are treated fairly from the outset and not expected to accomplish the impossible, and when at the same time they know they are getting valuable instruction to place them on equal footing with fellow workers, there is bound to be fostered a high regard for management. In the final analysis, the attitude of the foreman toward the newcomer is a reflection of management's attitude.

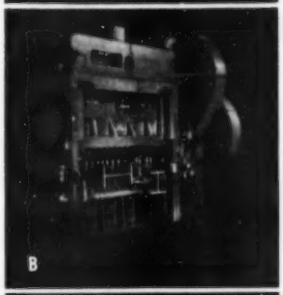
Selection of the right employee for a given task is only the first step in securing an efficient working force. Correct primary training is equally important in building a competent factory manpower organization. Good buildings, modern machinery, and up-to-the-minute physical organization of the plant may be of little value in use unless the human machine is so trained that it can be effectively coordinated as part of the entire production machine.

It is not enough for the foreman to train a new worker and then put him on his own. It is necessary also to follow up what he does and to obtain progress reports. These are in reality reports on what the worker has done during the previous day, week, or, work period. The information needed may be obtained either from the payroll tickets or production reports. It is necessary for the foreman to check in particular on the quality of the work done by the new man, amount of spoiled materials which have resulted from his work, and the probable errors in performance which may have caused the loss or damage.

A new man is bound to be expensive. How expensive he is depends upon how he is broken in on the job. If a new man is left to himself to pick up his job as best he can with little instruction from the foreman, he will be a very expensive man for the company. A new man will cost the least when he is carefully broken in and taught to do his work the right way from the start.

It takes time and effort to properly appraise a new man's worth to the company. If the proper ingredients are put into the induction effort, a good worker will be added to the company's assets. The results of an effective orientation program in the hands of a capable foreman pay off in lower production costs, reduced labor turnover, and higher quality. From the standpoint of worker morale, the treatment and the training


A


B

C

A. BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging and bending.

B. BEATTY Guillotine Beam Punch. Punches webs and flanges in "I" beams from 6 to 30 inches.

C. BEATTY Spacing Table handles web and flange punching without roll adjustment.

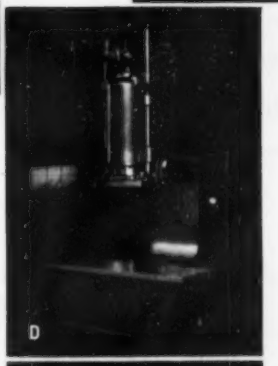
D. BEATTY Gap Type Press for forming, bending, flanging, pressing. Capacity 250 tons.

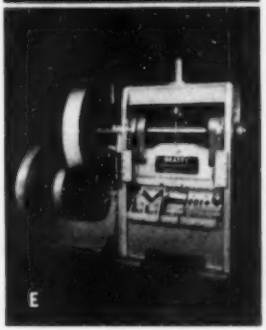
E. BEATTY Guillotine Bar Shear for angles, bars, rounds, squares without changing tools.

MATCH-MAKERS

BEATTY specializes in making machines to match various heavy metal working conditions and problems. If one of the machines shown can't be modified to suit your needs, we'll design and build one that does. Broad experience in varied metal working fields has taught us that there is always a better way to solve production problems. Let one of our engineers show you how the BEATTY way is a BETTER way to increased production and economy.

BEATTY
MACHINE & MFG. CO.
HAMMOND • INDIANA

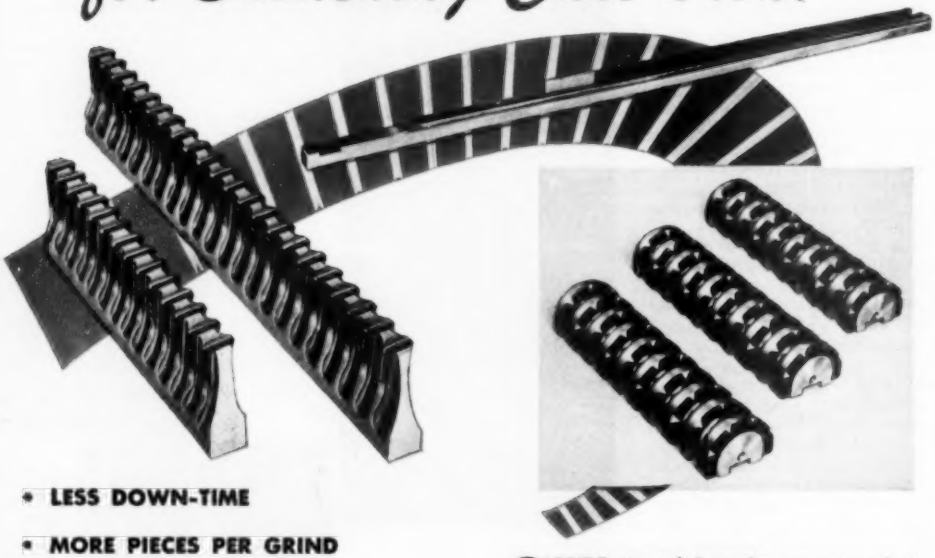

D


E

Specialists in Designing and Producing Carbide Cutting Tools

WESSON CARBIDE TIPPED BROACHES

for Broaching Cast Iron!



- **LESS DOWN-TIME**
- **MORE PIECES PER GRIND**
- **FINER FINISHES**

CARBIDE tipped broaches are new but Wessonmetal cemented carbide and Wesson Carbide tools are designed and produced with the combined skills of top metallurgists and specialists in carbide cutting tool fabrication. Broaching with Wessonmetal will mean less down-time, more pieces per grind, smooth cutting through scale, sand loaded areas and hard spots.

GET A QUOTATION ON WESSON CARBIDE TIPPED BROACHES FOR YOUR JOB TODAY. WRITE DIRECT OR ASK YOUR WESSON REPRESENTATIVE.

WESSON

First choice when tough metals are to be cut—
for special or standard purposes—
for single or multiple set-ups.

WESSON COMPANY *Affiliated with*
WESSON METAL CORPORATION
1220 WOODWARD HEIGHTS BLVD. • FERNDALE (DETROIT 20), MICH.

the new employee receives at his induction is perhaps the most important factor in his feeling and attitude toward the company and his future job success.

Harry Kaufman
Philadelphia, Pa

•

BORROW — OR STEAL?

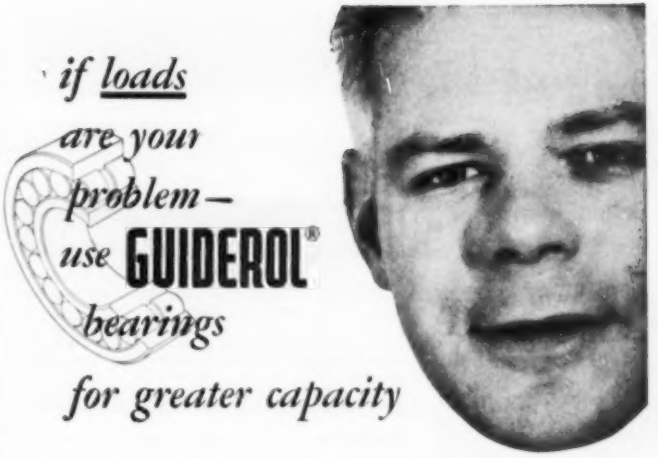
Should workers be allowed to borrow tools for occasional private use? Will such a policy lead to excess? Will the tool be borrowed anyway, if the request is refused? Readers say . . .

IN THE CASE under discussion, the foreman will have only himself to blame if he permits borrowing of company tools for a little private use by one of his men, and then finds himself enmeshed in a rash of requests from other employees for loan of tools. Arbitrary denial of such requests, backed by a shop ruling, is the best way of handling this problem.

"Hew to the line of right; let the chips fly where they may." A foreman who follows this admonition in his strict adherence to the company's property rights may stir up some trouble in hurt feelings, but he is doing his duty as management representative in running an efficient department and eliminating misplacement and loss. Limited lending of company tools for private use ultimately leads to excess; halfway measures are insufficient in meeting this problem.

The foreman who believes that it is better to let the men borrow tools now and then than to have them slip something under their coats and take them home to use anyhow, is sticking his neck out for future trouble. Taking company tools outside the plant for home use (whether by tacit consent of the foreman, or outright theft) is an infraction of established shop rules for protection of company property and will not be tolerated by a foreman who has the interest of the management at heart.

One plant found that the following method helped minimize the annoying problem of requests from workers for loan of company tools for private use, and help reduce theft. Instead of verbally repeating over and over again to all the workers the penalty for infraction of the rule, this company undertook to periodically confirm it by a personal letter to each man. A copy, given to every worker, emphasized the seriousness of the offense and



Are you looking for a way to carry greater loads more efficiently in smaller spaces — a way to improve the performance of your tougher bearing applications without increasing bearing space? You'll find the answer in McGill Guiderol Roller Bearings because guided rollers permit full type roller construction without any possibility of roller skewing with limited misalignment. Capacity wasting cages are eliminated and still excessive internal looseness can be avoided. They are available in the MT and CT series — interchangeable respectively with roller bearings of needle type dimensions and ball and cylindrical roller bearings of single and double row ball bearing dimensions.

For Immediate Shipment

14 sizes — ⅛" to 4" O.D. — in stock at all times for immediate shipment. Facilities and engineering skill immediately available for special specification jobs.

CURTIS UNIVERSAL JOINTS

Specialists in Universal Joints for over 30 years, Curtis offers more than just time saving availability. Made of the finest alloy steels, accurately machined — with either solid or bored hubs — they may be easily applied to most universal joint needs, ranging from instrument controls to heavy steel mill applications.

ONLY CURTIS OFFERS ALL THESE ADVANTAGES

Availability — 14 sizes always in stock.

Simplicity — fewer parts, simpler construction.

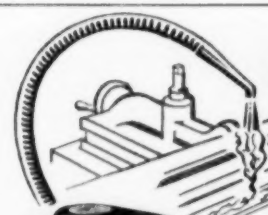
Government Tests — complete equipment for government tests in our plant.

Write today for free engineering data and price list

CURTIS UNIVERSAL JOINT CO., INC.
6 BIRNIE AVENUE SPRINGFIELD, MASS.

As near to you as your telephone

A MANUFACTURER OF UNIVERSAL JOINTS SINCE 1919



For Better Coolant Flow

choose

RUTHMAN GUSHER COOLANT PUMPS

Each Gusher Coolant Pump is the result of years of experience in building a *better* pump to give you *better* coolant flow. You get as much or as little as you want the instant you turn on the machine.

No packing or priming is needed . . . rotating parts are electronically balanced to cut vibration to a minimum . . . pre-lubricated heavy duty ball-bearings need no further attention.

So choose wisely—choose Ruthman Gusher Coolant Pumps.

THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

its penalty. An employee would not be likely, due to forgetfulness, to repeat the same mistake. The notice was signed by the foreman, the plant superintendent, and the lead man. The employee was also requested to sign a receipt in order to indicate in writing that he had received it.

One of the contributions made by a company to employer-employee relations at its plant is the publication of an annual report of the cases of theft and how they were handled. It is an interesting document in discipline control. An analysis of the cases reviewed during the year shows that theft from the company accounted for 18 cases, in 12 of which job-termination was found necessary. The current higher cost of tools, such as adjustable wrenches, micrometers, etc., has served to encourage some irresponsible individuals to steal them. Prompt action by the company, including police action, has kept these cases to a strict minimum in recent months.

Harry Kaufman
Philadelphia, Pa

•

LENDING COMPANY tools, if done with discretion, can do much to promote a feeling of good will between the company and its employees that sometimes produces unexpected dividends.

I have in mind an incident that occurred not so long ago in a company that employs some eight to ten men, most of whom own their own home or like to putter around the family car on weekends. This company had a rush job on one of their screw machines, and, as usually happens towards the close of the order, the machine broke down. In order to re-

"—Butter fingers!"

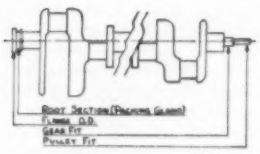
Salvage of rejects speeded by new metallizing alloy

outwears old bearing material 25 times

Automotive manufacturer replaces chrome plating installation with metallizing for salvage of mis-machined crankshafts; steps up output to 10 per hour

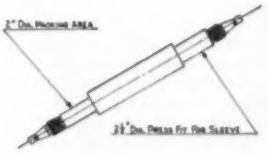
Sprabond Wire, the new self-bonding metallizing alloy, is speeding reject salvage in a wide range of production applications. It has been found particularly valuable in building up parts which have been machined undersize, or damaged by tool marks. Resulting surfaces are extremely hard and, due to their microscopic pore structure, tend to hold considerable amounts of oil. These factors produce excellent wear characteristics, some users reporting increases in service life as much as 25 times that obtained in any other way.

Application is simple and fast; only 3 operations: (1) the part is cleaned or undercut; (2) Sprabond Wire applied; (3) the surface finish-ground. Dovetailing and undercutting often not required and build-up can be carried to a feather edge. No danger of warpage because negligible heat is generated in the part during spraying.



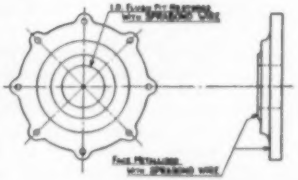
Better and faster than plating

Sketch shows automotive crankshaft of the type being reclaimed in quantity by large manufacturer. These parts were formerly reclaimed by plating, which was slow and expensive. With metallizing, however, production rate is 10 shafts per hour.



Where welding is impractical

Heat warping and consequent straightening costs made welding impractical for salvage of blower shafts such as shown above. Shafts formerly scrapped and replaced are now rebuilt. With Sprabond Wire metallizing, saving is $45.00 each.

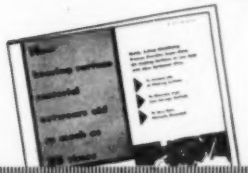


Fits restored—no re-machining

Press fit in electric motor end bell is frequently lost through wear. Welding is impractical here, too, because of warpage. But a few thousandths of Sprabond Wire on the I.D. builds a press fit so that even minimum grinding is often unnecessary. Savings per end bell—about $30.00.

Some other money-saving applications for the Sprabond Wire process

Cracked blocks and castings—flat surfaces—molds, patterns, match plates—sand holes thin sections—lathe ways—inside diameters—gas holes.



FREE BULLETIN Metco Bulletin 57B describes the advantages of the Sprabond Wire metallizing process in detail. Micro-photograph of Sprabond Wire coating on steel shows how it works. Use the coupon to send for your free copy today. No obligation, of course.

METALLIZING ENGINEERING CO., INC.
38-24 30TH STREET LONG ISLAND CITY 1, N. Y.
In Great Britain: METALLIZING EQUIPMENT COMPANY, LTD., Chobham near Woking, England

The following trade names are the property of Metallizing Engineering Co., Inc.: METCO®, SPRABOND WIRE. ®Reg. U. S. Pat. Off.

R. J. McWaters
Metallizing Engineering Co., Inc.
38-24 30th St., Long Island City 1, New York

Please send me Bulletin 57B.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

Savings reported by users of
LINCOLN PARK
CARBIDE GAGES

A large midwestern motor manufacturer, who has about 100 gages in constant use, found it necessary to check his steel gages for accuracy every day. Changing from steel to carbide gages eliminated this daily checking requirement and he now checks his carbide gages once every 12 weeks. It costs $ .85 to check each gage and based on a 250 day, 50 week year his annual savings with carbide gages are $20,896.00 on checking costs alone.

CARBIDE GAGES

For further information on how to reduce inspection costs with carbide gages, send for booklet—"If steel gages were *Free*."

DESIGNERS AND MANUFACTURERS OF:
SPECIAL AND STANDARD CARBIDE, CHROME PLATED, AND STEEL GAGES—CARBIDE ROTARY FILES—ALSO, FACILITIES AND SKILLED PERSONNEL AVAILABLE FOR PRECISION PARTS PRODUCTION.

THE PLUS IN PRECISION

Lincoln Park INDUSTRIES, INC.

1719 FERRIS AVENUE LINCOLN PARK 25, MICH.

pair the breakdown, which involved pulling a gear from a particularly hard-to-get-at spot in the base of the machine, every available resource was mustered in order to get this piece of equipment back in production.

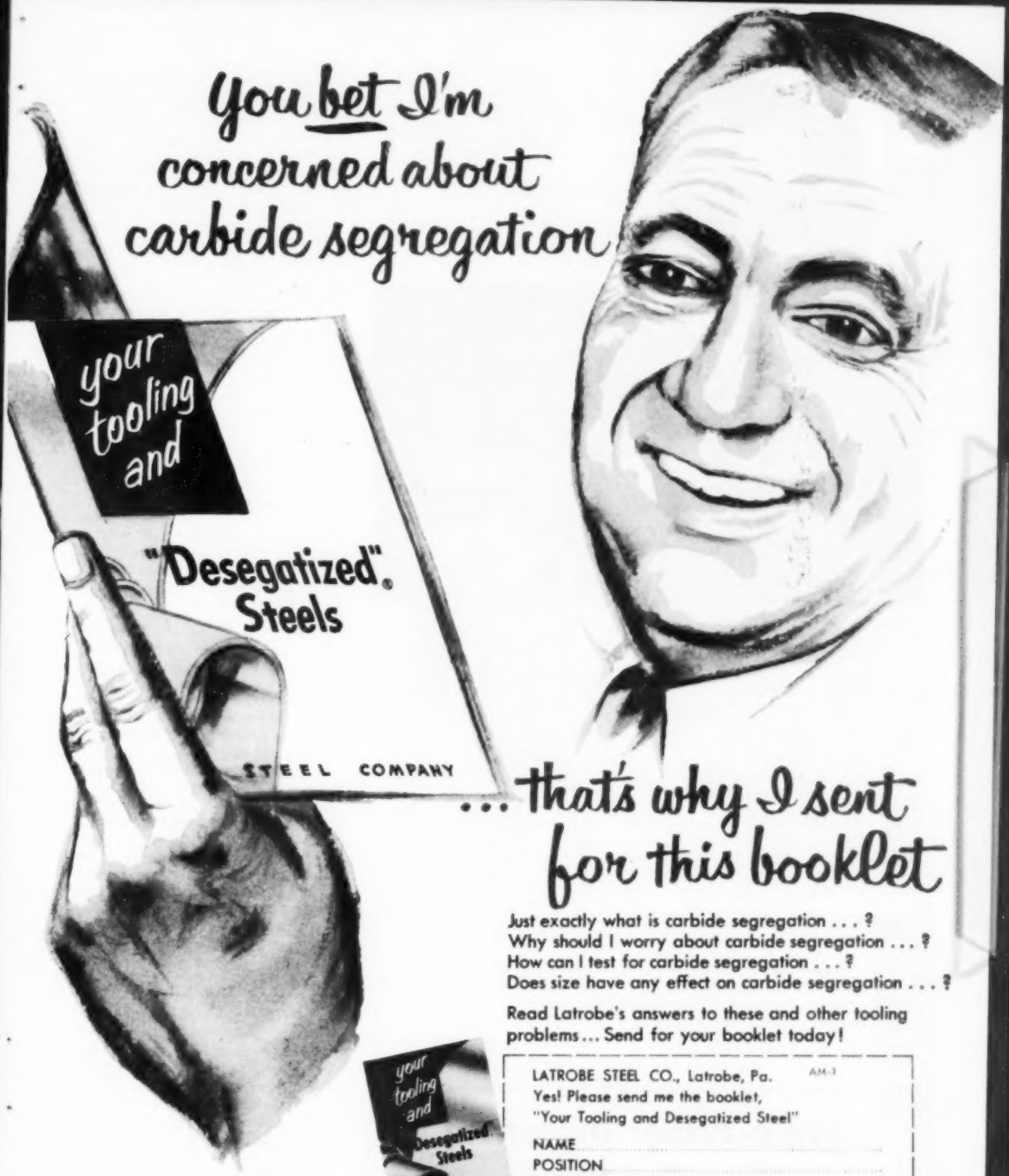
But one essential item was missing—the shop's wheel-pullers were all too large, and this being Saturday morning all the local suppliers were either closed or out of this particular item. So the super was faced with two alternatives—either wait till Monday to obtain the wheel-puller, or make up a substitute. In either case the time element was working against him and a good customer was going to be disappointed. As a disgruntled little group stood around the machine waiting for his decision, one of the newer employees joined them and inquired how things were going.

On learning the cause of the delay he said, "I'll have one for you in fifteen minutes—got it in my cellar back home." He was as good as his word and very soon appeared with the much-needed tool. Within the hour the screw machine was back in service good as ever. When the grateful supervisor expressed his thanks for the unexpected help and offered more tangible appreciation the lender waved it off with a grin. "You don't owe me a thing," he said, "I've been using the company's electric drill for several weekends now fixing up my summer place—one good turn deserves another!"

This particular incident points up the fact that the average man appreciates the company's effort to be "neighborly," and given a chance to reciprocate will do so. However, as

"That machine's been in constant production since it was turned on 3 years ago—nobody's ever found the 'Off' button."

You bet I'm concerned about carbide segregation



... that's why I sent for this booklet

Just exactly what is carbide segregation . . . ?
Why should I worry about carbide segregation . . . ?
How can I test for carbide segregation . . . ?
Does size have any effect on carbide segregation . . . ?

Read Latrobe's answers to these and other tooling problems... Send for your booklet today!

LATROBE STEEL CO., Latrobe, Pa. AM-3
Yes! Please send me the booklet,
"Your Tooling and Desegatized Steel"

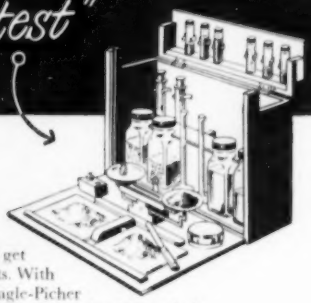
NAME .....
POSITION .....
COMPANY .....
STREET .....
City ..... Zone ..... State .....

LATROBE STEEL COMPANY

LATROBE, PENNSYLVANIA

Sole Producers of "Desegatized" Steels

"I never realized the difference in floor absorbents until I saw this test"



Follow the lead of other alert maintenance men, purchasing agents and safety engineers and get the true facts on floor absorbents. With his portable laboratory, your Eagle-Picher man can give you—right at your desk—a scientific analysis of your floor absorbent. *There's no obligation on your part.*

By this scientific test, you'll find how much coverage you're getting . . . how much oil and water are being absorbed for given bulk. Yes, and you'll discover how much your absorbent is costing you in terms of absorption and coverage . . . how much it gives you in terms of safety and light reflectivity.

So that you may truly form your own conclusions, your Eagle-Picher man will be happy to actually let you conduct the analysis yourself.

We want you to see that Eagle-Picher Floor Dry is insoluble . . . chemically inert and non-combustible . . . that its light weight assures exceptional coverage . . . that its light color makes for brighter working areas, extra safety.

Write today for full information.

Eagle-Picher Industrial Floor Dry No. 85

EAGLE EP PICHER

THE EAGLE-PICHER COMPANY

Since 1843 General offices: Cincinnati (1), Ohio

I mentioned in the first paragraph, company tools should be loaned out with discretion, having in mind the possibility that they might be needed over the weekend. Also, the borrower should be held strictly responsible for the return of the tool in an undamaged condition Monday morning.

In some instances, too, it may be necessary to use discrimination as well as discretion to curb the chronic borrower, as well as the fellow who uses company property for commercial purposes. In one case I heard of, an employee had several machines in his cellar working on the company's products for a subcontractor in his spare time. Which was legitimate enough, except for the fact that the company was unwittingly supplying this individual with perishable tools such as drills, reamers, etc. The payoff came when jigs and fixtures began to go a.w.o.l.

But this is the exceptional incident that proves the rule that lending company tools — with appropriate safeguards which I mention—usually pays off in morale-building goodwill between company and employee.

Robert S Alexander
Greenville, RI

•

A PLEASANT and trusting relationship existing between the employers and employees is of great value to both parties.

Where such relationships exist, tools are more carefully used and consequently last longer.

Tools that employees need for use outside of the shop are mostly used for repairs or improvements in the workman's own home, where, by their use, expenses are reduced thus creating loyalty.

It is hard to figure and prove actual gain by lending small tools as suggested. However, I have seen the

"I love antiques."

plan used very successfully. There is no doubt in my mind about its being a decided benefit to the organization as well as to the individual workers.

The tool-crib attendant should always be notified when a tool is to be taken outside of the shop so that it could be returned promptly if needed for an emergency.

My observations have nearly always been that it does not generally lead to excess. Of course, like many other practices, there are occasional cases where tools are used to excess. But where such instances have occurred, the individuals who did this have generally conducted themselves in undesirable ways in other respects as well, and would be the first ones laid off in slack times.

H B Martin
Watervliet, NY

•

IT IS ALMOST impossible to acquire all the tools a man might need around the house. Many men do their own maintenance in the home and on their car. They occasionally need some one tool which they must borrow from their neighbor or the shop. We would not deny our neighbor the use of a tool he did not have himself; neither should the shop deny the employee.

A policy can be laid down in writing whereby the employee must return the borrowed tool on the next working day. Every tool must be signed for, and signed for again for any additional day the tool is kept.

If a foreman does not use humane treatment the employee will go to the union steward. The foreman can learn a lot from the shop steward; he is always looking for an opportunity to serve the employees. That old Army expression applies to those who lead: take care of your men first.

A E Salmons
Philadelphia, Pa.

•

ED HAS THE answer, in that a refusal to lend shop tools to an employee for legitimate purposes evidences a petty attitude in a matter of small consequence. It is no different if the borrower is not an employee, but perhaps a copetitor or a neighbor.

The borrower is, of course, under an obligation not to abuse the extension of such courtesy and when he does so it is time enough to cross him off the list and tell him why he can no longer be extended such courtesies.

We operated a well-financed shop in Wisconsin at one time, across the

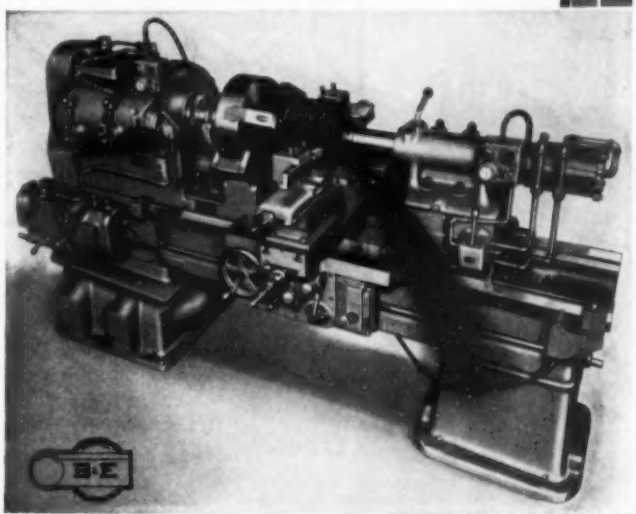
NOW BOYE' & EMMES *Stamina*
IN SPECIAL PURPOSE LATHES

Turning requirements strictly special? Boye' & Emmes Long Life, Heavy Duty Engine Lathe stamina can still be yours. For Boye' & Emmes Special Purpose Lathes are built to the same basic specifications which identify "Long Life" with Boye' & Emmes Engine Lathes.

HEADSTOCK *Stamina* BECAUSE

(1) Gears are in constant mesh, speed changes made through sliding jaw clutches. No gear wear due to shifting.

(2) Herringbone "back gear" in front of spindle exerts a powerful downward thrust to offset lifting action of cutting tool.



WORK:
Double tapering of graphite nipples.

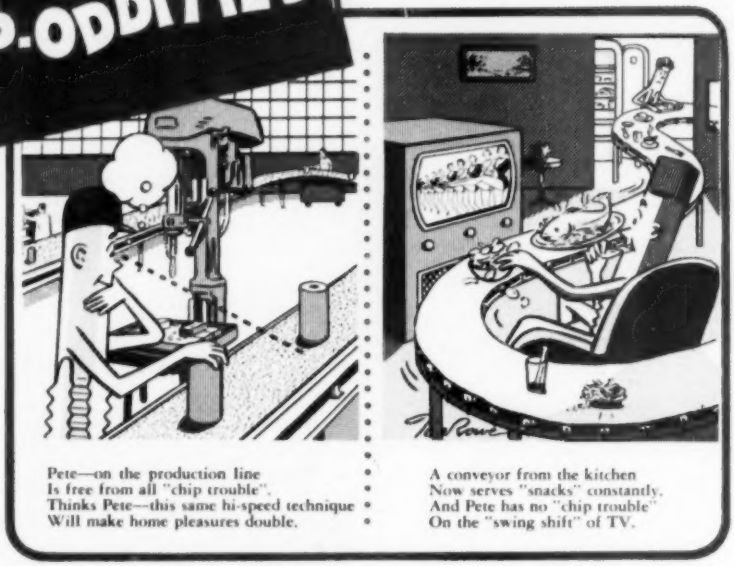
METHOD:
Stationary 18" air-operated chuck grips and centers work. Air-operated tailstock rams live spur center into end of workpiece, forcing it into headstock spur driver which extends through 6" center hole in chuck. Chuck then releases workpiece and cutting proceeds, front tool cutting taper from end to center while back tool cuts taper from center to end.

SPECIAL TOOLING:
Air-operated chuck. Air-operated tailstock. Front and rear tool holders. Taper attachment. Safety stops.

WANT DATA?
Write for our free Bulletin No. 604 today and read why stamina is basic in Boye' & Emmes Special Purpose Lathes.

BOYÉ & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO

TAP-ODDITIES



Pete—on the production line
Is free from all "chip trouble",
Thinks Pete—this same hi-speed technique
Will make home pleasures double.

A conveyor from the kitchen
Now serves "snacks" constantly.
And Pete has no "chip trouble"
On the "swing shift" of TV.

Manufacturers cannot afford to have production lines held up by "chip trouble" on a tapping operation, where one weak link in the chain, throws the entire setup out of gear.

That's why the dependable uniformity of BATH "ground from the solid" TAPS is an important feature wherever a rigid quality control system is maintained.

Bath Taps are designed to have ample chip room . . . the smooth flute surface permits chips to slide instead of piling up. Every Bath Tap is the same . . . no clogging . . . no binding to cause torn threads . . . no costly hold up of the production line.

For long wear and efficient work, insist on Bath ground thread Taps in stock or special sizes.

INSIST ON BATH TAPS
—PROFIT BY THEIR
PLUS—PERFORMANCE

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.

street from a little shop started by two young fellows with slender resources. It was not unusual for them to ask us to lend them some tap or reamer of a size they did not have. We never hesitated to do so because the tool was always returned in good order within a surprisingly short time. They were good borrowers and today they are an important unit of one of the very large implement-manufacturing corporations.

One of the two largest meat packers owned a portable hydraulic jack and the other used to borrow that jack on emergency occasions. But it was never returned promptly, and usually the owner had to send for it when needed in his own plant. The annoyance was ended by the owner deciding his competitor was not a qualified borrower and notifying him that a charge of five dollars an hour would be made for the use of the equipment.

After that they never sent for the jack until they were ready to use it and it was always returned within a few hours.

The writer has a considerable technical library and many years ago was concerned over the loss of around a hundred volumes that had been borrowed and never returned. Some could not be replaced. It was not unusual for some borrower to say long afterward that he had loaned the book to someone else and could not remember who it was.

So now a regular library card is used and its card is placed in a tickler file when a book is loaned. The card envelopes pasted inside the front covers of our books are printed —"A tickler in our files shows the date and party to whom this book was loaned. Its return within ten

"Hey, Pop, the shop wants to know if you've seen anything of fork-truck 5?"

the *tougher* the cutting job . . .
the *better* the opportunity for . . .

Abrasive Cutting

"FOR HEAVEN'S SAKE, SAWYER . . . HOW DID YOU GET INTO THIS FIX?"

Unusual cutting conditions like this are the exception . . . but whether you have a specialized application or a mass production job, you can depend on Allison Wheels. Whatever the material to be cut, there is an Allison Abrasive Cutting Wheel processed and formulated to fit the job. This means faster cutting with fewer rejects and reduced operating costs.

If you have a cutting problem, go to Allison — the specialist in abrasive cutting.

Allison ABRASIVE CUTTING WHEELS

THE *best* WAY TO CUT MANY MATERIALS
THE *only* WAY TO CUT SOME

SEND FOR THIS HELPFUL BOOK ON ABRASIVE CUTTING

THE ALLISON COMPANY
256 Island Brook Ave., Bridgeport 8, Conn.

Please send me your free booklet on Abrasive Cutting.

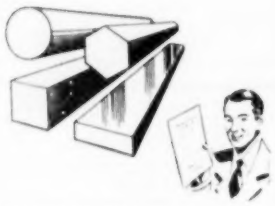
NAME: _____

ADDRESS: _____

Which of these special steels do you need?

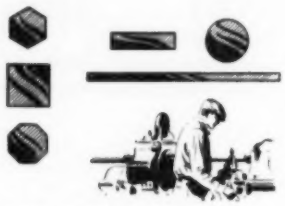
Call Ryerson for Quick Shipment

Right now, users of special purpose steels can get most of their requirements quickly—with one call to one convenient source. All the steels described on this page are in better-than-average supply at the Ryerson plant near you. All are high quality steels that conform to exacting specifications. Use this page to check the items *you* need, and save time by ordering them next time you call Ryerson.



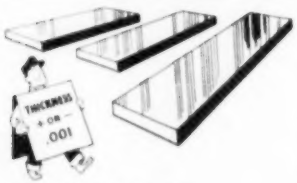
STANDARD ALLOYS

Rounds, flats, hex's, squares—hot rolled and cold finished—complete heat treatment guide with each shipment.



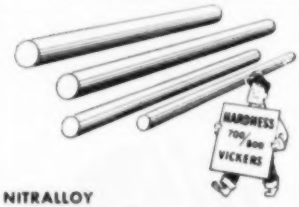
TOOL STEEL

Water, oil or air hardening tool steels. High in quality; economical in price. Hardening data with every shipment.



GROUND FLAT STOCK

High grade, non-deforming tool steel. Saves machining, speeds production. For accurate-to-size parts, tools, dies.



NITRALLOY

Develops extremely high surface hardness after nitriding. Unequalled for parts subject to abrasion. Large stocks.

OTHER PRODUCTS: CARBON STEEL BARS, STRUCTURALS, PLATES, SHEETS

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA
CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO
MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

days will save us the time and trouble necessary to remind you to return it and will help to keep you in good standing with us as a further borrower of our books."

When we have to ask for the return of a book, after sixty days, the borrower goes on our black list and when he asks for another, we say we are sorry but cannot give the book to him.

In lending shop tools to employees, Al should simply have it understood when return is to be made and file a tickler for the day after that, give a carbon copy of the tickler to the employee as an order for the tool crib to let the tool out, and tell the employee that when he returns the tool he must pick up the tickler and bring it back to Al to complete the transaction.

If the employee fails to perform as agreed he certainly cannot complain because he is afterward ineligible for further loans.

That gets away from any hard and fast rule that would work a hardship on the good borrowers.

Lucien I Yeomans
Chicago, Ill.

•

PIGS IS PIGS

How much responsibility has a machinist for keeping his work area in reasonably clean condition? Is this completely the sweeper's job, or will an able worker naturally tend to keep his territory orderly?

ANY EMPLOYEE who takes pride in his job makes it a point to keep his work place in order. Most plants have a man who sweeps the floor but does not clean the machines or workbench. That job is usually done by each individual employee.

With today's fast turnover of production, the floors get full of chips in a short time. No one wants to wallow around in a pile of chips. A clean workplace is a safer place to work.

There may be some individual who does not like the rules, methods, or policies of the shop. That does not excuse him from the things that are considered general practice. The rules and policies should be uniform or we have no policy.

We all encounter objections during the day's work. They start with a complaint made by one or another employee. A little tact on our part helps to determine the reason. If we are not careful they cause us to be the enforcer rather than the leader. Tact means control. A little time

spent in thinking the problem out, keeping cool, explaining the why and the need, usually solves the problem.

A E Salmons
Philadelphia, Pa.

THE QUESTION of who will clean up a man's working area may seem like much ado about nothing, but I have seen quite a few hot and heavy arguments on this very subject, and at least the breakup of one beautiful friendship. It has always seemed strange to me that a toolmaker, machinist, or machine operator will spend hours around his own home raking up leaves, painting, and other simple chores that come under the heading of good housekeeping, yet object strenuously to picking up a broom in the shop and cleaning up around his bench or machine, even when the slight exertion involved adds to his own comfort.

Nor will I ever be convinced that these individuals who refuse to have any truck with broom and shovel during shop hours are motivated solely by a desire to give the company one hundred percent of their productive capacity. In most cases their refusal to cooperate in the cleanup is 90% cussedness and 10% a curious idea that they will lose face if caught with a broom within the shop precincts. The implication being, of course, that they are a superior breed of cat to the fellow who uses a broom and shovel instead of vernier and micrometer.

There are situations, of course, where men are employed on an incentive basis, or where the setup is conveyorized, that make it inexpedient for them to take time out to clean up their work place. But management usually recognizes this, and makes arrangements to suit the

"Remember the day after Joe the Sweeper became naturalized, he insisted that the trouble with this country was 'too many foreigners'!"

FOR *Strictly* IMPERSONAL INSPECTION
CHOOSE AMES DIAL COMPARATORS

Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy – the results being in no way dependent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

Check the Ames Dial Comparators shown – one of them may solve a Quality Control problem for you.

Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated *Ames No. 1W* when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.

Ames No. 2 Dial Comparator is a compact, stable bench model for measuring non-yielding materials – sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. *Ames No. 2W* is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.

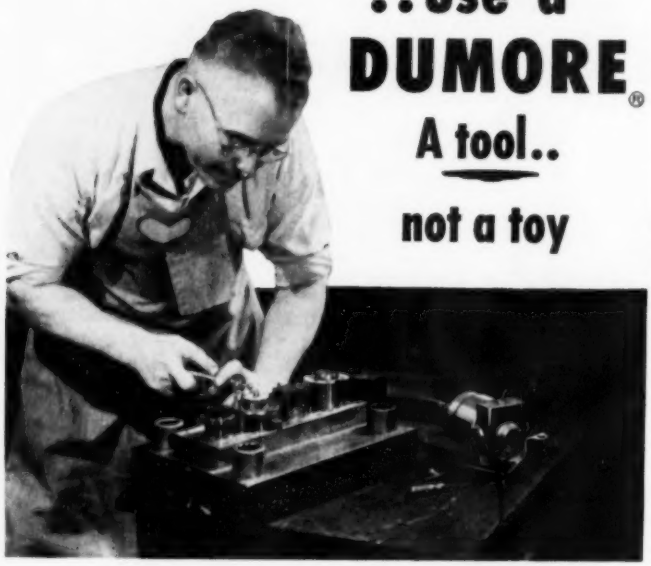
Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.

Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base, the adjustable indicator support on which can be mounted any Ames Micrometer Dial Indicator, and the upright column are proportioned to suit the user's particular requirements.

Send us your Quality Control job specifications, and we will supply complete details and proposal without obligation.

Representatives in principal cities B. C. AMES CO. *26 Ames Street Waltham 54, Mass.*
Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

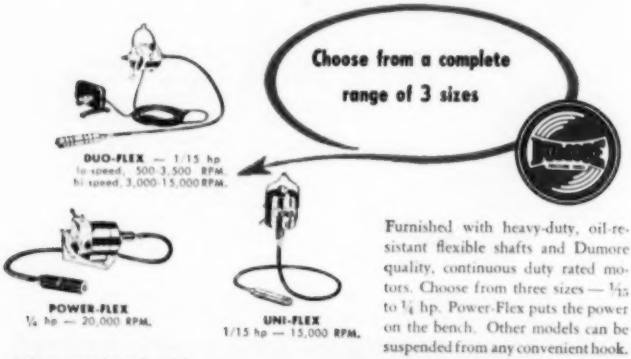
To step up hand-grinding production ..use a DUMORE® A tool.. not a toy



Don't be misled by extravagant claims for underpowered hobby-type tools. Manufacturers who want tip-top tool performance at all times turn to Dumore Flexible Shaft Tools.

These powerful, high-speed tools slash costs of light hand finishing operations . . . grinding, burring, filing, sanding, lapping, chamfering . . . on ferrous and nonferrous metals as well as wood, plastics, and ceramics.

The light, easily manipulated hand piece permits close, accurate control . . . reduces operator fatigue for steadier production. Their small work-head dimensions make them favorites, too, for multiple drilling setups on close centers. No matter what your job requirement, or your shop budget, Dumore has the *right* flexible shaft tool for you.



Furnished with heavy-duty, oil-resistant flexible shafts and Dumore quality, continuous duty rated motors. Choose from three sizes — 1/15 to ¼ hp. Power-Flex puts the power on the bench. Other models can be suspended from any convenient hook.

Ask your nearby industrial distributor for a demonstration of this quality line of Dumore flexible shaft tools or write - - -

THE DUMORE COMPANY
1337 Seventeenth Street • Racine, Wisconsin

conditions involved. In the average shop where things are not so specialized, and the sweeper performs other duties besides wielding a broom, such as running a cutoff saw, deburring, or other necessary chores, it sometimes happens he just can't be johnny-on-the-spot with the broom at all times. If he is a "good joe" his shopmates will usually cooperate and keep the area in their vicinity reasonably clean until he has a chance to make the rounds with his broom.

All in all, I think this boils down to a question of shop morale. Al can't compel the man from Kansas City to do work he wasn't properly hired to do, but if the rest of the men keep their work area clean, ways and means can be found to make him fall in line. If left severely alone he will soon get tired of playing in his own private pig-pen, and if he is a normal individual will realize there's no fun in being the horrible example.

Robert S Alexander
Greenville, RI

•

WHO RATES THE BOSS?

Is a foreman-rating card, to be filled out by the shop men, a healthy idea for general morale? Would such a policy result in overboard criticism, or might it not bring to light a few weaknesses which the foreman could easily correct?

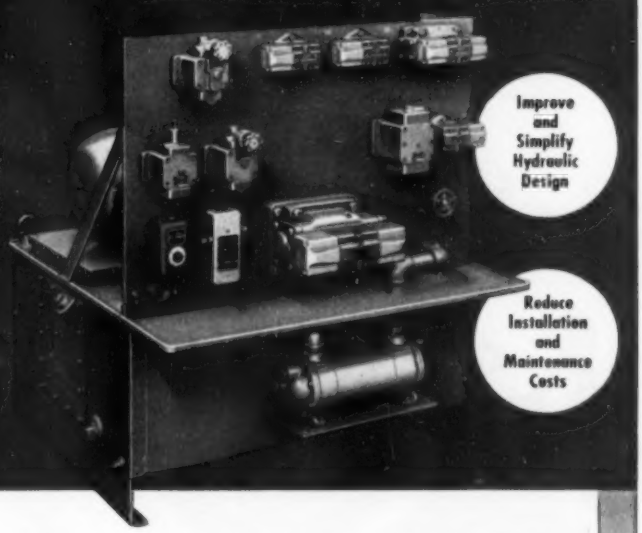
IT IS TRUE that a foreman is just another human being who is liable to just criticism, but whether this appraisement should be put on record for other than the foreman himself to see is a question to which many answers are forthcoming.

Assuming that Al's scheme is entirely personal—a mere whim to satisfy his own curiosity—it may give him some satisfaction in getting the opinion of his men as to how he stands in their estimation. "I just wonder what some of the boys think of me as a foreman?" he might say to himself. "Am I doing my very best or am I going along half-cocked?" He might wonder further, "What is there I can do to make myself more efficient in my department; in what way can I gain more cooperation so as to get the work out in less time?"

These are a few of the things that Al could feel a certain degree of uncertainty about, and the only way he can find out is to have his men come back at him with their views.

It Takes MORE than a Collection of Parts

To Make A VICKERS CUSTOM BUILT POWER UNIT



A Vickers Custom Built Power Unit is much more than a collection of parts . . . just as the machines you build are more than the castings, shafting, gears, motors, etc. that go into them.

The Vickers Unit is designed and built with the "know-how" obtained during more than a quarter century of experience in practically every kind of hydraulic operation, plus a thorough understanding of your needs. It is built exactly to your individual requirements. All necessary pumps, valves, intermediate piping, oil reservoir, motors, controls, etc., are in one compact and self-contained "package". It includes all needed hydraulic accessories such as oil filiers, air cleaners, oil level gauges, fittings, etc. Hydraulic connections may be grouped in a conveniently located manifold.

The result is simplification of hydraulic design and important savings in installation and maintenance costs. Vickers undivided responsibility for the entire hydraulic control system is another important advantage to both the machine builder and his customer. • Write for new Bulletin 52-45.

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

1410 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices:

ATLANTA • CHICAGO (Metropolitan) • CINCINNATI • CLEVELAND
DETROIT • HOUSTON • LOS ANGELES (Metropolitan) • NEW YORK
(Metropolitan) • PHILADELPHIA (Metropolitan) • PITTSBURGH
ROCHESTER • ROCKFORD • SEATTLE • TULSA
WASHINGTON • WORCESTER

6053

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

"M-40-U"
ALLOY CENTERS

Give You PRODUCTION-PROVEN
"DEEP CORE DESIGN"

Get more for your center dollar with Gorham "DEEP CORE DESIGN!" "M-40-U" Alloy Centers are PRODUCTION-PROVEN in the largest plants. They consistently outlast high-speed and other alloy centers, stand far more abuse. Although equal to carbide in wear resistance, they cost less, are easier to redress.

And Gorham's exclusive "DEEP CORE DESIGN" allows many more redressings, too! A core of "M-40-U" Alloy, developed by Gorham expressly for wear, abrasion and heat resistance, is induction brazed deep in the shank, after which the entire center is finish ground, giving you wear material permanently supported by tough shank steel!

Gorham "M-40-U" Alloy Centers are available with Morse, B. & S. or Jarno taper shanks. Immediate delivery on popular sizes, "specials" to specification. Free literature gives description, dimensions, prices. Send for your copy today.

NOT JUST A CAP
NOT JUST A TIP
BUT A DEEP SOLID CORE!
"DEEP CORE DESIGN"

Gorham TOOL COMPANY
"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"
14408 WOODROW WILSON • DETROIT 3, MICHIGAN
WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

di-acro PUNCH
NEW DOUBLE PURPOSE PRESS

Available in two sizes, 6" and 12" throat depth

Now you can punch holes of various shapes as large as 4" diameter in 16 gauge steel—also blank, draw, emboss, form—all with the new DI-ACRO Punch. It is ideal for both experimental and production work.

The precision ground triangular ram of this double purpose press prevents punch head from turning, assuring perfect alignment at all times for accuracy in duplicated parts.

A Turret Stripper of exclusive DI-ACRO design automatically strips material from punches of all shapes. Roller Bearing cam action develops 4-ton pressure with minimum effort. Adjustable gauges assure exact location of holes.

Send for "DIE-LESS DUPLICATING" Catalog

Gives the full story of the DI-ACRO Punch, and also DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, as well as the new DI-ACRO Vari-O-Speed Powershear and Hydra-Power Bender.

DI-ACRO is pronounced "DIE-ACK-RO"

DI-ACRO DIE-LESS DUPLICATING
O'NEIL-IRWIN MFG. CO.
311 EIGHTH AVENUE • LAKE CITY, MINN.

Whether he would lose face in submitting to their opinion is a question—some would say it made no difference while others would consider it a mark of executive weakness.

There is no doubt about it but that Al will have to possess a pretty rugged constitution in order to survive the storm of comments coming from a bunch of fellows who have been released from the stockade of silent opinion. It's a certainty that all the advice, coming from men who have been asked to speak their minds, is not going to be to Al's liking—in fact, some of it is likely to give him a case of bluedevils for some time to come.

Al could benefit materially if he were sixty-five Rockwell tested and could slough off the injurious accompaniments with magnanimous skill. What a satisfaction he would get out of one of his men telling him that he was too soft in his dealings with erratic employees. Can't you picture the poor fellow tossing in his sleep, trying to justify some action brought about by someone's infraction? Again I say that Al's got to have some stainless steel guts in order to take what some of the fellows are capable of handing out.

There are some men who wouldn't cooperate in such a scheme; they'd prefer to keep their opinions to themselves rather than take a chance of offending. Some would take the view that they would rather keep their ideas under their hats to use at a later date when conditions were more auspicious for their own welfare.

Oh, it's a change from the regular routine to have your men confide in you, but you must be magnanimous in your acceptance of conscientious advice. Whether Al's scheme is recommended depends on the capacity of the individual to take it. He can grow in stature by his ability to swallow something or

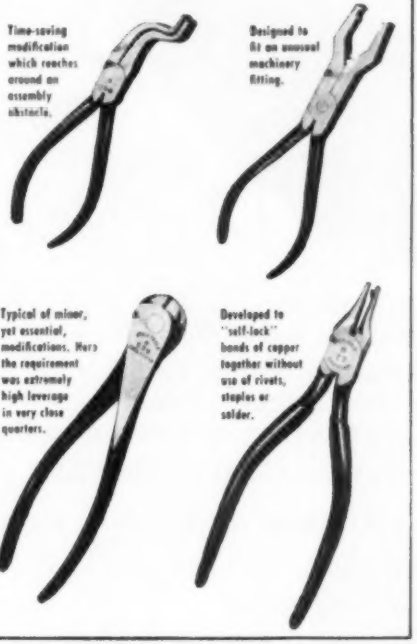
UTICA

IS SPEEDING THOUSANDS OF JOBS WITH

CUSTOM PLIERS

Custom Tools Like These

simplify the unusual,
solve the difficult,
and speed the slow-moving.


Time-saving modification which reaches around an assembly obstacle.
Designed to fit an unusual machinery fitting.
Typical of minor, yet essential, modifications. Here the requirement was extremely high leverage in very close quarters.
Developed to "self-lock" bonds of copper together without use of rivets, staples or solder.

Save a few seconds a ***thousand times*** on the production line — and that means real money!

Here in a nutshell is the case for custom tools by UTICA, manufacturer of the world's longest line of pliers.

Let us take over the problem. Let us send one of our sales engineers to check your production line for time-saving possibilities. Custom tools can ***speed, simplify,*** or ***eliminate*** an operation. Such a survey would be without obligation to you, of course.

NO ONE IS SO WELL QUALIFIED TO SOLVE YOUR SPECIAL PROBLEM AS UTICA

Address inquiries to CUSTOM TOOL DEPARTMENT

It pays to use quality tools — U TI CA® — and the world's best tools are made in U.S.A.

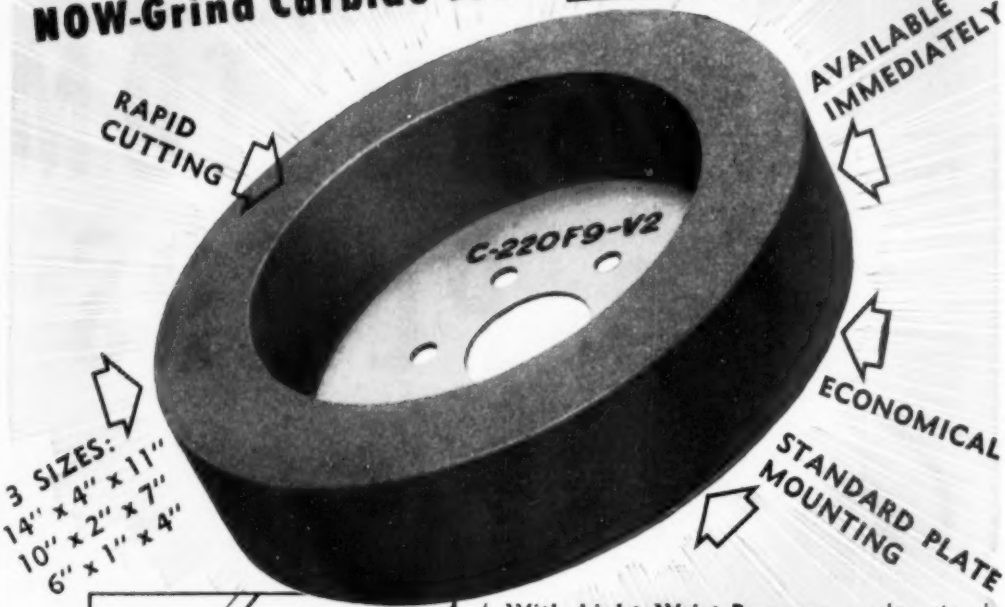
DROP FORGE AND TOOL
CORPORATION

UTICA 4, NEW YORK

In Canada
ADLAM TOOL & SUPPLY CO., LTD., MONTREAL;
WALLS-IRONS, LTD., WINNIPEG

GOOD NEWS!

NOW-Grind Carbide Tools WITHOUT Diamonds



With Light Wrist-Pressure, under steady coolant flow, these BAY STATE wheels:

1. ***FINISH-GRIND*** **CARBIDE SINGLE POINT TOOLS.**
2. **CUT AS FAST AS DIAMOND WHEELS.**
3. **CUT COSTS TO A MINIMUM.**

IMMEDIATELY AVAILABLE FROM STOCK, these new BAY STATE specifications have been especially developed to help you meet the present and continuing diamond shortage.

TO KEEP PRODUCTION GOING
TO SAVE HARD-TO-GET DIAMOND WHEELS
TO KEEP CARBIDE CUTTING EDGES KEEN

Take advantage of Bay State's Advanced Engineering.

BAY STATE

ORDER A TRIAL WHEEL TODAY

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U.S.A.

Branch Offices and Warehouses: Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

he can make his life miserable by letting sound advice stay in his intestines too long and ferment.

When the appraisal cards go out to the office—coming from the office directly to the men—we're treading on thin ice. To me this savors of treachery on management's part for the purpose of getting something on the foreman. I doubt very much if you will find many who will be sympathetic to such a scheme. Were I approached by management, I would go to my foreman, if he had treated me squarely, and tell him that I would refuse to fill out such a form.

Here is a case where the foreman finds himself on the spot for a good broiling by the unscrupulous few. One cannot tell what screwy ideas may pass on to the office by this route. There are some people who delight in stirring up trouble if given a legitimate excuse. The foreman-appraisal plan is just such an opportunity. If there is any checking up to be done, let the next higher in authority do it.

J Homewood
Ontario, Calif

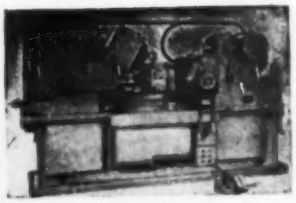
NEW BOOKS

MEMBERS' HANDBOOK (5TH EDITION) —*Published by The Gauge and Tool Makers' Association, Standbrook House, Old Bond St, London, W 1, England* —
Current and continuing interest in British-made tools and gages makes this handbook particularly interesting to potential buyers of this equipment. It lists each member company by name, and then gives a breakdown by products—from arbors to V-blocks—and lists the names of the companies manufacturing each product. The last two pages list the members of the British Power Press Assn. This is not a division of the GTMA, but the latter provides full secretarial service for it. The book is free, on application to the publisher.

•

RESEARCH AND DEVELOPMENT IN THE UNITED STATES AIR FORCE—*Issued by Air Research and Development Command, Baltimore, Md. 32 pages. Free on request from Commanding General, Headquarters, ARDC, Post Office Box 1395, Baltimore 3, Md.*

A neatly styled and edited booklet to assist contractors who desire to



The outstanding advantage of this machine is a... handle operations on ... two or three ends of a ... simultaneously or in sequence, ... *out changing set-up or* ... It is the only standard machine that will do this.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence—a method exclusive with Goss & DeLeeuw and offered on this machine.

For complete details ask for illustrated bulletin. Send samples of your work for time and cost estimates.

GOSS & DELEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

FILLING AN ORDER BY AUTOMATIC SPINNING. Automatic machines, developed by Teiner, permit precision spinning to reduce costs on long-run items. Example of the all-gauge — all-metal — any-quantity — spinning capacity available at Teiner. ***Write for color Brochure 52 A.***

ROLAND TEINER COMPANY, INCORPORATED
134 TREMONT ST., EVERETT 49, MASS. Tel. EV 7-7800

EVERY TYPE PRECISION GEAR

. . . produced to your specifications

"Mass Gear" offers machining and cutting facilities for producing all types of precision gears in small and medium sizes. Gear tooth finishing and inspection equipment are backed by a competent staff of gear-producing specialists.

You can depend on "Mass Gear" service to meet your individual requirements. Submit your specifications . . . ask for a "Mass Gear" estimate.

Massachusetts Gear & Tool Co.
WOBURN, MASS.

accomplish research and development work for USAF, the publication describes ARDC's work, organization, and contractural-relations program. It should answer a number of inquiries that have been received from industrial sources on how to go about research work for the Air Force.

•

RECOMMENDED PRACTICES FOR METALLIZING. PART 1B—APPLICATION OF ALUMINUM AND ZINC FOR PROTECTION OF IRON AND STEEL. *Published by American Welding Society, 33 W 39th St, New York 18, N Y. 10 pages. Price $0.50.*

Materials and equipment to be used, technique of surface preparation and metallizing, and inspection procedures for verifying the adequacy of the coating are covered in this brochure. Also included is the use of organic coatings as additional protection, and typical protective coatings for general, salt, and industrial atmospheres, and salt and fresh water.

•

MAPI ACCOUNTING MANUAL (1952)—*By MAPI Accounting Council and Subcommittee on Manual Revision. Published by Machinery and Allied Products Institute, 120 South La Salle St, Chicago 3, Ill. 350 pages. 8¾ x 11¼ in. Price $15.*

Here is an outstanding book for financial management in Metalworking business. It was prepared by the Accounting Council of the MAPI which consists of 50 financial officers and accounting executives from companies producing capital goods and industrial equipment. The operating experience, studies, and discussions of this executive group are reflected in the manual, which includes:

I Classification and Description of Accounts
II Financial Statements and Reports
III Property, Plant and Equipment
IV Manufacturing Cost
V Sales Engineering and Administrative Expenses
VI Pensions
VII Internal Control and Auditing
VIII Cost Estimating and Its Uses
IX Profit Planning and Budgeting
X Recognition of Changing Value of Dollar Bibliography

As a guide for establishing a financial program in a new plant, or adjusting an existing accounting system to the complex demands of today's business, this book should prove extremely helpful. Chapter 10, "Recog-

nition of Changing Value of Dollar" describes a condition which is far too frequently overlooked in current and, especially, long-range planning. The method outlined in this chapter alone may return the price of the book many times over.

Techniques in applying LIFO (last in—first out) and FIFO (first in—first out) inventory programs, plus the rules governing each system, should also be of considerable interest. If this book serves no other purpose, it will provide a guide and checklist for reviewing your present methods in the light of modern practice.

•

DUTIES AND TAXES ON IMPORT OF TOOLS AND GAUGES (2ND EDITION)—*Published by The Gauge and Tool Makers' Association, Standbrook House, Old Bond St, London, W 1, England. Price 10 shillings.*—This is a most valuable brochure which gives complete details of the Customs Duties and Taxes levied by the principal world markets on the importation of tools and gages. It includes the decisions made at the Torquay conference on tariffs, and deals with markets in Europe, the Middle East, Far East, Latin America, Africa, Australasia, India, Pakistan, Canada, and USA.

•

HERBERT H DOW, PIONEER IN CREATIVE CHEMISTRY—*By Murray Campbell and Harrison Hatton. Published by Appleton-Century, Inc, 35 W 32nd St, New York, N Y. 169 pages. Price $3.50.*

The story of the founder of an industry is always a good subject for a book, particularly if it is well written, as this one is. One advantage of writing such a book is that the authors usually have access to industrial records and files, and can therefore make a more complete analysis of the man than they could with only personal records. This one was written with the cooperation of the Dow Chemical Company.

Herbert Dow was evidently something of a chemist, but much more of an engineer and a business man. His intense interest in the mechanical problems of setting up new processes was one of his prime characteristics; another was his perfect faith in himself and his ideas, which, in many other people, would be called blind optimism. In this case he was usually right, so his confidence was not often misplaced.

Bay State Taps

Precision performance for **profitable** production... on nearby shelves of industrial supply distributors...

BAY STATE TAP & DIE COMPANY • MANSFIELD • MASS.

Coniflex* type bevel gear, used in lift truck

Three Cheers for Gears by CINCINNATI

Ever know a customer of The Cincinnati Gear Company who was anything but satisfied? That's because we stand behind our products. If there was ever an order not right—we made it right. And that's why customers everywhere have confidence in us.

We would like to work with you too. If you have a gear problem, talk to us about it. Since 1907 we have been delivering quality gears made by expert craftsmen. So wire, write or call.

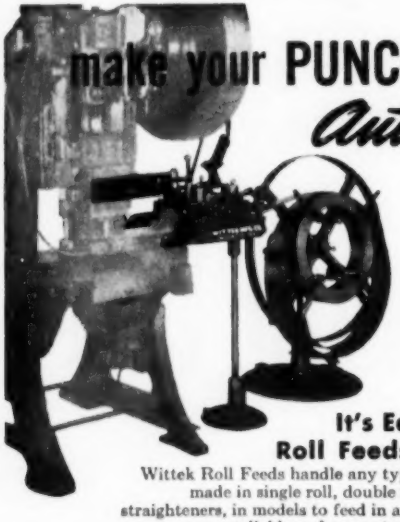
Spur
Helical
Worm
Herringbone
Internal
*Coniflex Bevel
Spiral Bevel
Spline Shaft

*Reg. U. S. Pat. Off.

THE CINCINNATI GEAR COMPANY

"Gears . . . Good Gears Only"

Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio



make your PUNCH PRESSES *Automatic*

It's Easy . . . with WITTEK Roll Feeds and Reel Stands

Wittek Roll Feeds handle any type of coiled strip stock and are made in single roll, double roll, and compound types with straighteners, in models to feed in any of four directions. They are reliable and accurate with simple, quick adjustment of feed length. Standard sizes and models meet a wide variety of press size and capacity conditions.

Wittek Reel Stands facilitate handling coiled stock.

*Write for full particulars

WITTEK Manufacturing Co.

4320 W. 24th Place, Chicago 23, Illinois

Automatic ROLL FEEDS AND REEL STANDS

Herbert Dow started off with a theory that was, in 1886 or so, revolutionary. He figured that he could make money and provide goods that were or would be needed by utilizing all or as much as possible of a given natural resource. His era was the tail end of the era of waste, where huge forests were leveled, farming was done in a superficial manner, and most industries just skimmed the top to net a quick profit—and plenty of quick profit there was, too. The Dow approach was to take natural brine, extract bromine, then proceed to extract many more chemicals from the same brine. As evidenced by the Dow Chemical Company's present stature, it was a good idea.

The story of magnesium involves not only the difficulty of extracting the metal from magnesium salts, but is threaded with the problems of creating a market for the metal when it was not thought of as a structural material. Magnesium was produced for years with no certainty that it would be sold, and factory stockpiles were always high. History again proved Herbert Dow right. Although magnesium is still not as important a structural material as it should be and undoubtedly will be eventually, its importance is recognized. During the Second World War the magnesium-manufacturing capacity of the country was finally pushed to get out every pound of metal it could make—the first time there was more demand for magnesium than there was magnesium available.

The book is non-technical, a point that will disappoint many engineering readers, but the story is interesting and some few technical details of what the Dow company did are included.

•

WELDING WITH STAINLESS STEEL ELECTRODES—*Published by Lincoln Electric Co, 22801 St Clair Ave, Cleveland 17, Ohio. 32 pages. Price $0.25.*

Reprinted from Lincoln's *Procedure Handbook of Arc Welding Design and Practice*, this booklet is designed as a handy reference to the single subject covered by its title. It deals with welding of chrome-nickel steels, with aud without molybdenum, as well as with straight chrome steels. The welding procedure for each type of steel is adequately covered. Also given are the AWS—ASTM classifications of corrosion-resisting chromium and chromium-nickel steel electrodes.

GO "AMERICAN" FOR CIRCULAR WELDED PRODUCTS

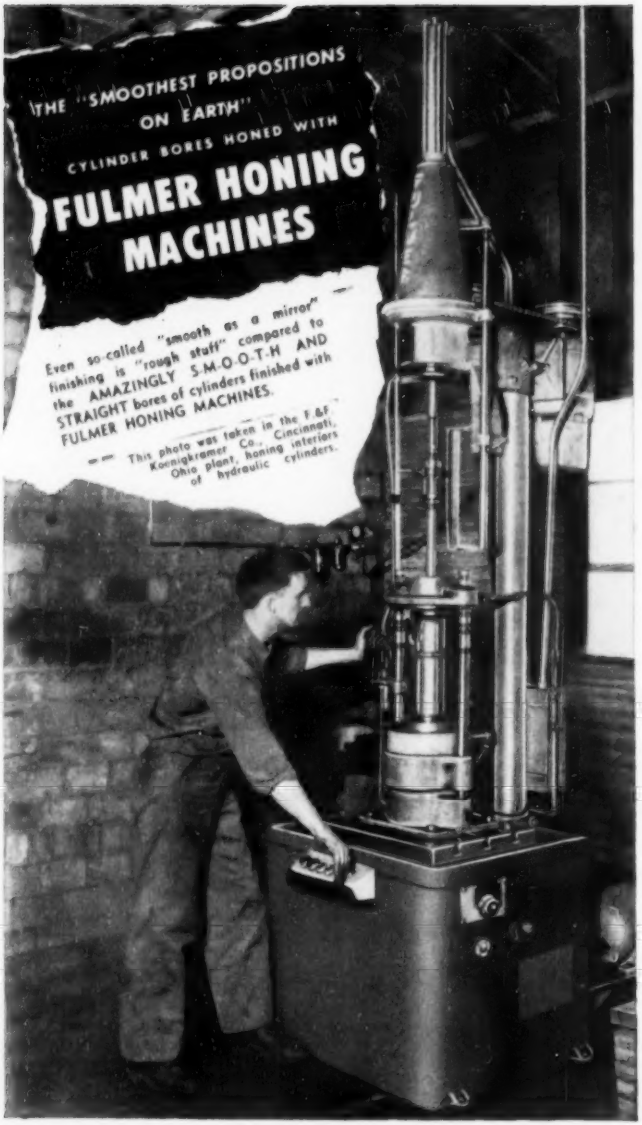
Welding is our business. Let us put our 34 years of experience to work for you.

Complete designing, engineering and metallurgical service is available where fusion or resistance welding of either ferrous or non-ferrous metals is required.

Send for your copy of our 20 page illustrated catalog

THE AMERICAN WELDING & MANUFACTURING CO. · WARREN, OHIO

LET US SEND YOU MORE FACTS OR BETTER YET SEND US YOUR SPECIFICATIONS FOR PROMPT QUOTATIONS


THE "SMOOTHEST PROPOSITIONS ON EARTH"
CYLINDER BORES HONED WITH
FULMER HONING MACHINES
Even so-called "smooth as a mirror" finishing is "rough stuff" compared to the AMAZINGLY S-M-O-O-T-H AND STRAIGHT bores of cylinders finished with FULMER HONING MACHINES.
This photo was taken in the F & F Kornigkramer Co., Cincinnati, Ohio plant, honing interiors of hydraulic cylinders.

Tolerances as close as .0001 (±). 15 sizes available for diameters from ¼" to 30" and strokes from 12" to 84". For ferrous and non-ferrous metals, glass, plastic etc.

WRITE FOR YOUR PERSONAL COPY: "WHAT TO KNOW ABOUT HONING"

105 EAST FOURTH ST. CINCINNATI 2, O.

C. ALLEN FULMER CO.

NAMES in the NEWS

A Donald Kelso

A Donald Kelso has been named president of Norton Behr-Manning Overseas Inc, succeeding **Herbert A Stanton,** who is retiring. Mr Kelso has been serving as executive vice president of the company formed a year ago to handle export business and foreign plant operations of Norton, and its subsidiary, Behr-Manning Corp of Troy, NY. He was formerly president of Durex Corp, and Durex Abrasives Corp.

Vincent F Flaherty has been appointed plant manager of Yale & Towne Mfg Co's new lock and hardware factory at Gallatin, Tenn. Mr Flaherty, connected with the company for 24 years, has served in various capacities, most recently as special assistant to the general manager.

John Davies has been appointed assistant chief engineer of the Eaton Mfg Co's Axle Div, Cleveland, succeeding the late **Harry H Hooker. Chester D Christie** was appointed staff engineer.

Ralph W Dickson has been appointed division supt, west mills, of US Steel Co. **Edwin J Blanning** succeeds Mr Dickson as division supt, central mills. Mr. Dickson has served in various capacities with the organization since joining it in 1927. Mr Blanning was formerly assistant division supt of primary mills in the company's Youngstown district. **Edgar B Speer** has been appointed division supt of steel production at the Gary works. He succeeds **Oscar Pearson,** who becomes assistant general supt at the Duquesne, Pa, works.

(*Continued on page 273*)

WITH THESE COMPONENTS . . .

DoALL PRODUCTION NEWS

Vol. 1 Published by The DoALL Company, 254 N. Laurel Ave., Des Plaines, Illinois No. 9

Production Upped 100%—Tool Life Increased 75 Per Cent by DoAll Band Machining Methods

Contour Cutting, Friction Sawing Save Man Hours and Materials

The Surface Combustion Corporation of Columbus, Ohio, manufacturers of "Janitrol" heating equipment find that DoALL Band Machining is the fastest, easiest method of cutting stainless steel rounds, tubing and certain stainless steel heater parts.

The DoALL Zephyr Band Machine is used to cut away one side of circular, aircraft heater spinnings—leaving a narrow strip intact along one edge. Formerly a power band saw was used on this operation to cut away the entire side of the spinning. A narrow strip then had to be cut from the waste material and welded back to the edge of the spinning.

Showing section removed from aircraft heater spinning by simple band machining technique.

R. M. Huntsberger, engineer at the Columbus plant, reports that by eliminating unnecessary steps in the above operation, DoALL Band Machining has increased production 100% over the method previously used. Saw blade life is 75% greater, man hours have reduced 8 per day at a savings of $16.24, and material savings amount to 5¢ on each spinning turned out. In addition, fabrication of the parts is more accurate with less operator fatigue.

In a straight cut-off job at the Surface Combustion Corporation where a power hack saw was formerly used, the DoALL Zephyr Band Machine with a DoALL saw band for friction sawing, has reduced cutting time on 2¼-inch stainless steel rounds from five minutes to sixteen seconds per round—time savings of almost 475 percent.

Versatile DoALL Band Machining methods have a place in every industry for maintenance or production work. DoALL Contour Sawing is the fastest known method for machining to shape all metals, glass, wood, cloth, leather, rubber, paper, plastics and other materials. Contour cutting makes it easy for the operator to follow any layout line—cut where he wants to cut at great speeds with a saving in time, material and labor. The endless band tools slice cleanly and evenly through the material, cutting all the time, all the way.

Cutting section from aircraft heater spinning with DoALL Zephyr band machine.

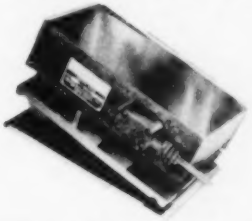
Literature and information is available upon request.

Electro-Magnetic Sine Chuck Increases Grinder Productivity

Faster Set-ups For Angular Grinding: Greater Accuracy

Using an electro-magnetic sine chuck, angular set-ups on any surface grinder can now be made precisely and easily. Whether the job calls for single or compound angles, the set-up can be made in a matter of minutes instead of hours with this precision holding tool.

On any type of surface grinding, the powerful electro-magnetic sine chuck holds the work securely throughout the operation. There is no distortion and no warpage of the work piece. There are no dials—no scales for calibration. Standard gage blocks insure accuracy which is unattainable by any other means. This new attachment is simplicity itself. The only moving part is a simple, rugged precision bearing. The electro-magnetic sine chuck is available through all local DoALL Service Stores. Further information on request.



Electro-magnetic sine chuck available for DoALL surface grinders.

New Rachet Feed Saves Work Time, Blade Life

A combination ratchet level feed and adjustable work holding jaw for straight or contour bandsawing affords maximum cutting rates with longer band tool life. There is no guesswork as to how much feeding pressure is being applied. The level arrangement allows the operator to actually "feel" the cutting action of the band and maintain maximum cutting rates without overloading.

The simplicity of the design, setup and operation of the attachment eliminates high initial cost and maintenance encountered with hydraulic or motor driven types. Literature available on request.

———See Next Page———→

NEW!

DoALL MICRO-STEP GAGING SYSTEM

HERE, for the first time is the means for directly applying gage blocks to thousands of precision measurement jobs which previously could be checked only with less accurate gaging setups.

—the means for securing micro-inch accuracy on *inside* as well as outside measurements.

—the means for assembling *gage-block* gages of every conceivable type, including gages up to 72″ long.

—the means for making pin gages, snap gages, indicating gages, height gages, depth gages, go and no-go gages for use not only in the lab, but in the toolroom and shop as well.

Here, in short, is a practical, economical means of securing superior dimensional quality control, of reducing rejects and wasted time, material and money.

Key to the system are the new DoALL Gage Holders and gage block-accurate End Standards with full exposed measuring surfaces. No other gage system offers such a combination.

For complete details, call your local DoALL Sales-Service Store, or write:

THE DoALL COMPANY

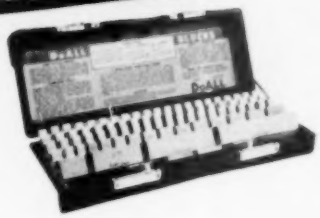
254 N. Laurel Ave., Des Plaines, Illinois

DoALL

ASK FOR NEW CATALOG

New Catalog describes the DoALL Micro-Step Gaging System in detail. Lists all gage blocks and standard end holder sets. Free on request.

WITH THESE COMPONENTS . . .



DoALL BLOCKS

Accuracy second to none in the world. Most complete line of sets available, 6 to 118 pieces, including a new set having gage blocks up to 20.000″ long.

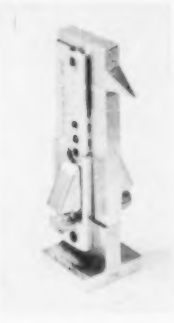
QUICKLY ASSEMBLED LIKE THIS . . .

1. Select the holder, end standards and gage block combination for any gage you need.

YOU MAKE GAGES LIKE THESE . . .

Internal gage-block gage calibrating indicating snap gage.

Assembled height gage for checking milling cutter setting.

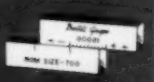


Height gage with scriber and standard for layout work.

CALL DoALL

See your Classified Phone Directory for Local Sales-Service Stores

Optical Flats



Toolmaker's Gage Blocks

Vee Rests and Clamps

NEW DoALL END STANDARDS

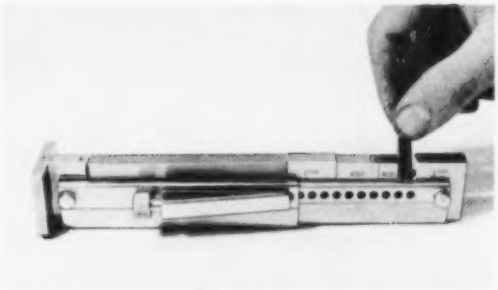
Here are gage block-accurate End Standards with fully exposed measuring surfaces which, when used with DoALL Gage Holders, make possible gage-block gages for every internal or external measuring job.

NEW DoALL GAGE HOLDERS

Channel-type holders available for making gages from 2" to 72" length. Quickly, easily assembled. Also a caliper holder for gages up to 6". For use only with DoALL End Standards and standard rectangular gage blocks.

NEW DoALL DIAL INDICATOR ASSEMBLIES

Here is the means of mounting dial indicators in any desired position in a DoALL Gage Holder to make indicating gages of all kinds.



2. Assemble holder, snap detent pins through end standards and insert correct gage block combination.

3. Press clamps into channel holes and tighten thumb screws snugly. That is all there is to it.

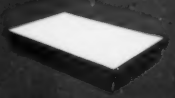
Internal indicating pin gage checking parts in the shop.

Pre-calibrated indicating comparator made with DoALL parts.

Micro-inch accurate indicating snap gage in use in the shop.

Go and no-go gage assembled with Micro-Step components.

This millionths-accurate indicating height gage is six feet long!



Silver King Reports New Claw Tooth Band Cuts Faster Gives "100%" Better Finish

Greatly Increases Output Cutting Center Hole Hub Area and Trimming Hard Aluminum Castings

For cutting the center hole, hub area, and trimming hard aluminum sand castings where straightness and finish of cut are critical, the Silver King Corporation, Aurora, Illinois, swears by the new DoALL Claw Tooth saw band.

Using the Claw Tooth Band, production has been stepped up with a 400% increase in blade life—125-150 work pieces are now machined per thousand feet of blade. The finish is straight, flat and "100%" better. The saw band previously used for these operations produced only 35-40 pieces per thousand feet of blade. The finish was poor; the feeding slow and hard.

The DoALL Claw Tooth saw band has an extremely hard edge, flexible back, and teeth of positive rake angle. Claw Tooth Bands cut metals, woods, and plastics remarkably fast because the positive rake gives freer cutting with less feed pressure. The clawlike teeth literally pull themselves into the material being cut.

Because of the extreme hardness developed in the new toothing technique, claw teeth retain their cutting edges and set far longer than hardened teeth ordinarily do. As a result, it costs substantially less to use fast-cutting claw tooth bands.

New DoALL Claw Tooth saw bands are available only from stocks of local DoALL stores. Complete information and literature supplied on request.

DoALL Claw Tooth bands are packaged in exclusive strip-out container.

Usage Bears Out DoALL Ground Flat Stock "Controlled Quality"

Usage proves that DoALL Ground Flat Stock is not just an ordinary tool steel—some of it good and some of it bad. Usage proves that "Controlled Quality" DoALL Ground Flat Stock is an oil hardening tool steel that never varies from the high standards set for it.

Exacting controls from electric furnace to packaged piece guarantees correct analysis—fast, easy machinability—accurate dimension—uniform hardening—freedom from surface defects and decarburization.

Usage bears out that "Controlled Quality" DoALL Ground Flat Stock actually means longer wearing tools, parts and dies for industry—saves time and money on every job.

238 sizes are carried in stock by local DoALL stores. Size and price charts are available on request.

For further information, call or write your nearest DoALL Sales Store.

CALL DoALL locally at these Sales-Service Stores

ATLANTA, GA.
304 Decatur St., S.E.
Call DoALL: Walnut 5384

BALTIMORE 12, MD.
5621 York Rd.
Call DoALL: Hopkins 5340

BIRMINGHAM 4, ALA.
800 N. 24th St.
Call DoALL: Birmingham 3-0502

BROOKLINE 46, MASS.
89 Washington St.
Call DoALL: Longwood 6-9555

BUFFALO 23, N. Y.
1063 Kenmore Ave.
Call DoALL: Riverside 3424

CEDAR RAPIDS, IOWA
624 Fifth St., S.E.
Call DoALL: Cedar Rapids 3-0616

CHARLOTTE 2, N. C.
401 S. Mint St.
Call DoALL: Charlotte 4-2579

CHICAGO 39, ILL.
4650 W. Fullerton Ave.
Call DoALL: Albany 2-5300

CINCINNATI 2, OHIO
536 Sycamore St.
Call DoALL: Main 3929

CLEVELAND 3, OHIO
6517 Euclid Ave.
Call DoALL: Express 1-1177

DALLAS 2, TEXAS
1628 Industrial Blvd.
Call DoALL: Riverside 4536-37

DAYTON, OHIO
725 S. Main St.
Call DoALL: Michigan 2121

DENVER 4, COLO.
1187 Stout St.
Call DoALL: Alpine 7444

DETROIT 27, MICH.
15010 Plymouth Rd.
Call DoALL: Broadway 3-4141

GRAND RAPIDS 7, MICH.
410 Hall St., S.E.
Call DoALL: 5-2191

HARTFORD 5, CONN.
45 Farmington Ave.
Call DoALL: Hartford 5-6664

HOUSTON 2, TEXAS
121 St. Emanuel
Call DoALL: Capital 6588

INDIANAPOLIS 2, IND.
1401-3 N. Illinois St.
Call DoALL: Plaza 6496

JACKSONVILLE 7, FLA.
1106 Kings Ave.
Call DoALL: Jacksonville 9-7087

KANSAS CITY 6, MO.
1019 E. Truman Rd.
Call DoALL: Harrison 5857

LOS ANGELES 21, CALIF.
1316-18 S. Santa Fe
Call DoALL: Trinity 3871

MILWAUKEE 5, WIS.
2427 W. North Ave.
Call DoALL: Division 2-2950

MINNEAPOLIS 14, MINN.
1328 S. Fourth St.
Call DoALL: Atlantic 4341
St. Paul—dial red "O" for Zenith 2399

NASHVILLE, TENN.
1923 Church St.
Call DoALL: 42-0605

NEW YORK 10, N. Y.
67 Lexington Ave.
Call DoALL: Murray Hill 4-1514

NUTLEY 10, N. J.
88 Park Ave.
Call DoALL: Nutley 2-6767

PHILADELPHIA 24, PENNA.
2053 E. Glenwood Ave.
Call DoALL: Cumberland 8-7400

PITTSBURGH 21, PENNA.
600 Rebecca Ave.
Call DoALL: Fremont 1-5200

ROCHESTER 5, N. Y.
215 Central Ave.
Call DoALL: Hamilton 8420

ROCKFORD, ILL.
123 Seventh St.
Call DoALL: Rockford 47848

SAN DIEGO, CALIF.
(Customer Service)
Call DoALL: Main 8-2840

SAN FRANCISCO 3, CALIF.
952 Howard St.
Call DoALL: Garfield 1-4784

SEATTLE 22, WASH.
520 E. Pike St.
Call DoALL: East 7500

ST. LOUIS 6, MO.
1945 N. Broadway
Call DoALL: Central 3620

TOLEDO 6, OHIO
2952 Monroe St.
Call DoALL: Garfield 8309

TULSA, OKLA.
207 W. Archer St.
Call DoALL: 35443

MONTREAL, QUEBEC, CANADA
583 Inspector St.
Call DoALL: University 6-1264

TORONTO 10, ONTARIO, CANADA
37 Clarkson Ave.
Call DoALL: Redfern 4238

MEXICO CITY, D. F., MEXICO
Calle de les Artes #48
Call DoALL: Mexicana 36-27-95
or Ericcson 18-63-74

No. 9—70M

PRINTED IN U.S.A.

Albert W Boegner has been appointed purchasing agent for Link-Belt Co's new Colmar, Pa. plant; **F Walter Skerett** succeeds him as purchasing agent of the Philadelphia plant. **Kendrick M Hickman** has been named assistant sales manager for general products at the Ewart plant in Indianapolis; **Carl Rudman** succeeds him as manager of agricultural sales.

Irving R Taylor has been named assistant manager of the Warren Machine & Die Div of the American Welding & Mfg Co, Warren, Ohio. Mr Taylor had been associated with the Taylor-Winfield Corp for the past 10 years; since 1947 he has been the company's development engineer.

David A Thomas

David A Thomas has been appointed executive vice president and general manager of Automatic Steel Products, Inc, Canton, Ohio. Prior to his new appointment, Mr Thomas served as executive vice president and general manager of American Insulator Corp, New Freedom, Pa.

J T Maidens has been appointed manager of the Philadelphia territory of Morse Twist Drill & Machine Co, New Bedford, Mass. He has recently been transferred from the Indiana territory, where he will be replaced by **James D Oakley**, who will work under the supervision of District Manager **Frederick Helms**.

Thomas F MacLaren has been appointed Chicago representative of Brown & Sharpe Co, succeeding **Howard K Jackson**, who has been given special assignments by the home office. **Frank K Wilkey**, formerly located in San Francisco, succeeds Mr MacLaren at the Los Angeles office. **Henry T Spooner** of the Providence home office, will join the Los Angeles sales organization.

There is no way under the sun to do small, precision tapping with "production" speed, satisfactory tap life and acceptable accuracy, other than to use a tool designed for the specific purpose.

THE *Hamilton* SUPER-SENSITIVE SMALL HOLE TAPPING MACHINE *IS SUCH A TOOL!*

The complete story of this machine is told in our Bulletin T-471.

IT'S FREE. ASK FOR IT!

THE *Hamilton* TOOL COMPANY
910 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

O. K. Pete! From here on in shave at home. I know how razor sharp Clarite Tool Bits are!

COLUMBIA TOOL STEEL COMPANY • CHICAGO HEIGHTS, ILL.

Producers of fine tool steels—High Speed Steels Die Steels—Hot Work and Shock Resisting Steels Carbon Tool Steels.

TOOL COLUMBIA STEELS

Precision Fabricated • **Machine Bases**

...AT LOW COST!

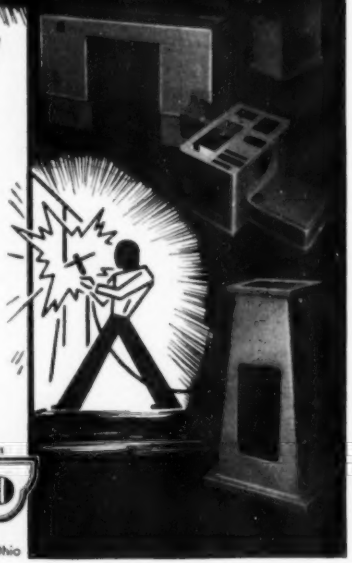
MODERN DESIGN—Welded metal fabrication lends itself to efficient, modern design. Littleford modern machines and skilled men make shaping of metals a simple task.

LESS WEIGHT AND BULK—Unwieldy and needless mass and weight are eliminated in a Littleford Fabricated Base.

STURDY AND SHOCK PROOF—Littleford fabricated metal units have all the inherent strength, toughness to withstand shock, strain vibration and severe service.

ADAPTABILITY—Littleford Fabricated Bases adapt themselves to changes and improvements at any time with a minimum of expense.

Littleford complete fabricating and manufacturing facilities are at your service. Send blueprints for estimates on Bases, Guards, Pans or special Machine Parts, see how Littleford fabricated products can save money.



FABRICATORS OF PLATE AND SHEET METALS

LITTLEFORD

LITTLEFORD BROS., INC.
421 E. Pearl St., Cincinnati 2, Ohio

R H Filsinger, Jr, has been appointed Pittsburgh district manager, Vanadium Corp of America; he succeeds **John B Girdler,** recently appointed sales manager. Prior to his appointment, Mr Filsinger served as eastern district sales manager.

Eric O Prange has been appointed district manager of the Detroit branch office of Claud S Gordon Co, Chicago. Mr Prange was formerly plant and tool engineer with the Michigan Steel Casting Co.

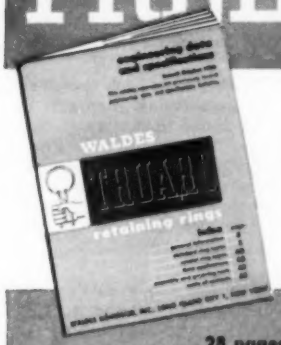
John E Angle has been appointed general supt of US Steel Co's Gary Sheet & Tin Mill, and **Robert W Holman** has been named his assistant. **Charles M Shank** succeeds Mr Holman as division supt of maintenance and utilities.

W S Truesdell has been appointed to the newly-created position of assistant general manager, Buffalo Steel Div, H K Porter Co, Tonawanda, NY. Mr Truesdell, with the company for 22 years, has been serving as general sales manager, and will continue his supervision of this activity, while assisting in the overall management of the division.

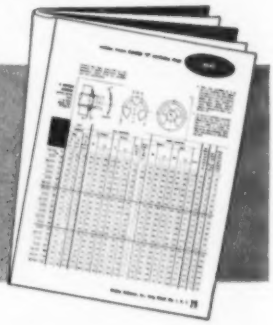
William J Fleming

William J Fleming has been appointed general manager of General Electric Co's lighting and rectifier department. Mr Fleming, manager of engineering and manufacturing for the GE X-ray department for the past two years, succeeds **Dr A F Dickerson,** retired. **E R Koester,** formerly manager of manufacturing of the small appliance division, has been named manager of manufacturing for the X-ray department. **Dr Martin A Edwards,** previously engineering manager of the company's general engineering laboratory, has been appointed engineering manager, X-ray department.

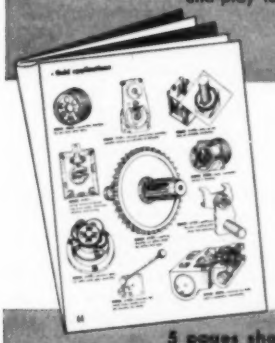
FREE to every engineer with an industrial fastening problem! The most complete catalog on retaining rings ever published!



This encyclopedia of retaining rings combines—*in one 52 page volume*—engineering specifications and data for 17 different ring types—more than 600 different sizes. Gives assembly data, typical applications, everything you need to know about selection and use of Waldes Truarc Retaining Rings.



28 pages of charts giving complete engineering data and specifications. Dimensions of Rings, Grooves, Shafts, and Housings; Clearances; Allowable Thrust Loads; Safety RPM Limits. Data on end-play take-up. Countless other engineering data, arranged in easy-to-read, easy-to-use table form.



6 pages showing typical cost-cutting applications and case histories, covering self-locking rings; basic type rings; rings for taking up end-play; rings for radial assembly; and special rings.

5 pages showing drawings of assembly and accessory tools, designed to handle Truarc retaining rings on a speedy, production line basis. There are data on tools for recessing grooves, pliers and applicators for assembly, and the new Truarc "E"-ring dispenser. **You will find the new Waldes Truarc Retaining Ring Catalog** *invaluable in selecting and specifying Truarc retaining rings, the better way to hold parts together.*

WALDES
TRUARC
REG. U. S. PAT. OFF.
RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,392,947; 2,393,068; 2,416,852; 2,420,921; 2,420,361; 2,439,705; 2,441,868; 2,455,185; 2,493,389; 2,493,393; 2,497,802; 2,497,903; 2,491,396; 2,509,091 AND OTHER PATENTS PENDING.

MAIL THIS COUPON TODAY FOR YOUR COPY!

Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.

AM-114

Please send the new complete Waldes Truarc Retaining Ring Catalog. (PLEASE PRINT)

Name_____

Title_____

Company_____

Business Address_____

City_____ Zone_____ State_____

Industry's most Complete Line
UNIVERSAL BRONZE
JOHNSON SLEEVE BEARINGS AND BEARING METALS
ELECTRIC MOTOR
GENERAL PURPOSE CAST BRONZE
GRAPHITED CAST BRONZE
LEDALOY SELF-LUBRICATING
All these types of bearings and both Johnson Universal Bronze and Johnson Quality Babbitt are available from stock at your local Johnson Distributor's. In fact, he is able to furnish practically all your sleeve bearing needs from his stock. There are over 400 sizes of Universal Bronze in cored and solid bars. The range of sizes in Johnson Cast Bronze GP (General Purpose) Sleeve Bearings has been increased to over 900 sizes. For special applications, Johnson Bronze will design and manufacture sleeve bearings to your requirements.
JOHNSON BRONZE COMPANY
515 South Mill Street, New Castle, Pa.
BABBITT METAL
Sleeve Bearing Headquarters Since 1901
JOHNSON BEARINGS
Sleeve-Type

Sam R Read has been appointed staff engineer of Visi-trol Engrg Co, Detroit. Mr Read, formerly associated with the Commerce Truck Co, and Hinkley Motors, will serve as full-time consultant on processing, planning, and design of complete production lines for automotive and aircraft engines, automatic transmissions and related component parts.

John L Myers has been appointed products engineering manager in charge of design, manufacture, and inspection, National Electric Products Corp, Pittsburgh. Mr Myers has most recently been in charge of development engineering of the company's television and radio department, Electronics Div.

D J Jones has been named general sales manager, Honan-Crane Corp, Lebanon, Ind. Mr Jones joined the company in 1948; prior to his present promotion, he served as district manager for the eastern sales territory.

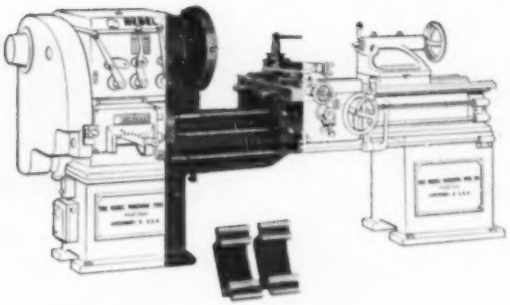
Martin Bizjack has been appointed supt of machining at the Chrysler Detroit tank plant. Mr Bizjack has been associated with tank manufacturing operations at the Detroit Arsenal since June 1947; for the past 18 months he has been general foreman of machining and fabrication.

Harold A Burnip has been named director of purchase engineering for the Lincoln Electric Co, Cleveland. He has been a member of the organization for 10 years; most recently, as project engineer, he supervised the building of the company's new $10 million plant.

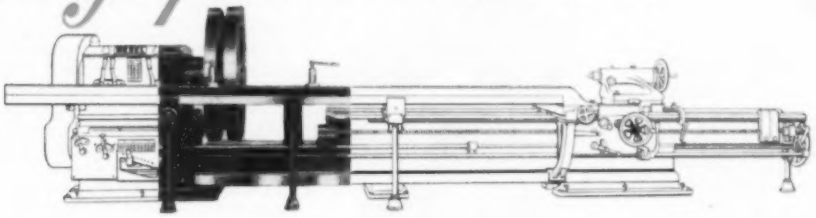
Otto Janssen has been appointed to the newly-created position of manager of spare parts sales of AiResearch Mfg Co, Los Angeles. Mr Janssen, who joined the company six years ago, moves up from his post as assistant manager of the customer service dept.

Fred S Durham, Jr, vice president and secretary of Bonney Forge & Tool Works, Allentown, Pa, has been named director of the company's sales. **Harry J Seaman** has been appointed field supervisor, and **E S Sensenderfer** is new manager of merchandising.

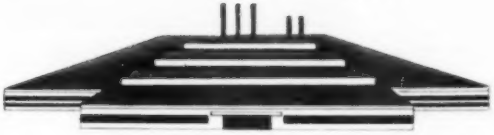
Henry Taylor has been appointed assistant to the director of research at Aerovox Corp, New Bedford, Mass. He has been a member of the department for the past 12 years.



the gaps in our line



fill a need in



your plant!

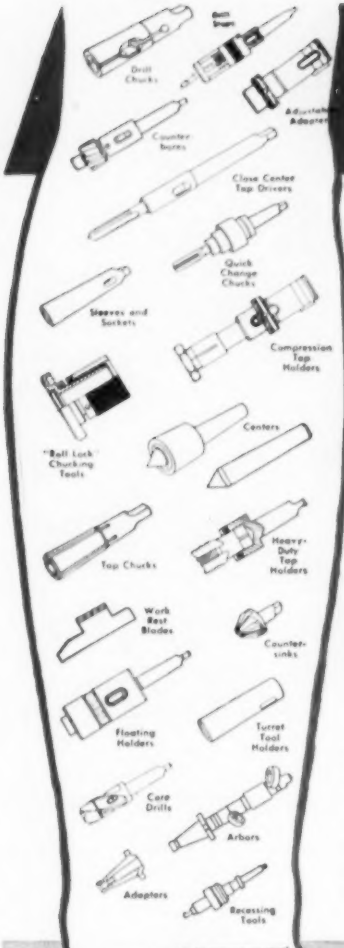
If you have a variety of big, bulky, odd-shaped pieces to turn regularly, you need a Nebel gap lathe. Either a removable block gap or an extension bed gap. Depends on your individual requirements. Your Nebel distributor, located conveniently close to you, will be glad to help you decide which is better. Why not phone him now?

THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.

fine lathes at modest cost since 1899 . . .

write for free bulletins!

Nebel



THE NEW CHUCKING TOOLS

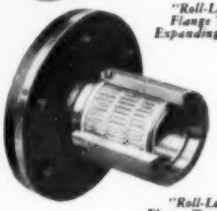
POWERFUL AND ACCURATE

. . . for precision work

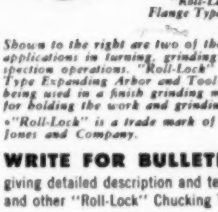
SCULLY-JONES

"ROLL-LOCK"* CHUCKING TOOLS

"Roll-Lock" Expanding Mandrel



"Roll-Lock" Flange Type Expanding Arbor



"Roll-Lock" Flange Type Chuck

"Roll-Lock" Mandrels, Arbors and Chucks use a new chucking method for holding work or tools. This method takes advantage of the elastic properties of metal.

When a very little turning force is applied to actuating ring or cone, the powerful wedging action of rollers expands or compresses the chucking surface to a shrink fit. This permits maximum torque and thrust to be transmitted, assuring accuracy often less than .0001". "Roll-Lock" Chucking Tools are engaged or disengaged quickly and easily. Yet the shrink fit cannot be loosened by reversing the rotation of the tools or by shock and vibration.

Shown to the right are two of the many applications in turning, grinding or inspection operations. "Roll-Lock" Flange Type Expanding Arbor and Tool Chuck being used in a finish grinding machine for holding the work and grinding tool.

**"Roll-Lock" is a trade mark of Scully-Jones and Company.*

WRITE FOR BULLETIN No. 17-50

giving detailed description and technical data on these and other "Roll-Lock" Chucking Tools.

Scully-Jones and Company

1902 S. Rockwell St., Chicago 8, Ill.

YOU GET LOW COST FAST ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

the "ARMS and HANDS" for your MACHINE TOOLS

If you think of a Lathe, Mill, Multi-Spindle Machine, or other Machine Tools as being a human body, supplying power to the parts of the body doing the actual work, then Scully-Jones tools represent the "Arms and Hands"

YOUR PROBLEMS ARE OUR PROBLEMS

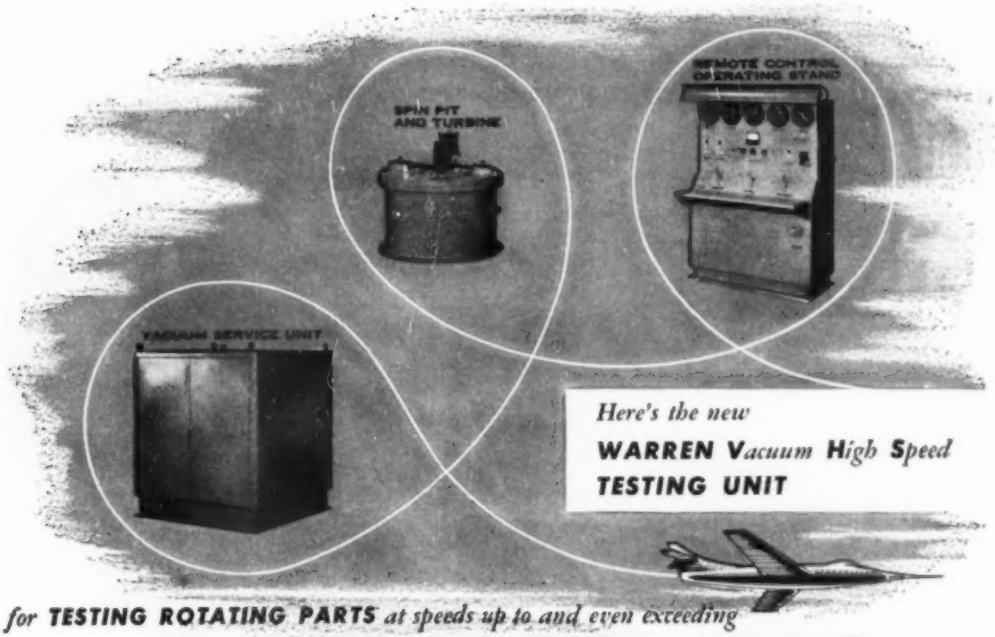
Helping you solve your tooling and production problems is Scully-Jones first objective. Ever since 1912 we have designed, developed and manufactured tools to the highest standards to help you get fast, accurate production at low cost.

That is why you can purchase S-J Tools and get the best that engineering research, modern equipment, correct materials and expert workmanship can produce.

Use these S-J "Arms and Hands" to equip your machine tools. They will help you get low cost, fast, accurate production on such operations as drilling, reaming, tapping, milling, counterboring, countersinking, core drilling, recessing or undercutting, boring and grinding.

For current information on S-J Tools, refer to Catalog 600. Write on your company letterhead for your copy.

Let us help you solve your tooling and production problems. Because our manufacturing facilities have been expanded, we're in a position to give you reasonable deliveries. For quick service see our nearest representative or contact Scully-Jones direct.



Here's the new

WARREN *Vacuum High Speed*
TESTING UNIT

for **TESTING ROTATING PARTS** *at speeds up to and even exceeding*

100,000 rpm!

AFTER DYNAMIC BALANCING to observe any possible vibration of the rotating parts of gas turbines in military aircraft, it is imperative that they be tested at **abnormal speeds** — speeds beyond those that would ever be encountered in actual use.

PARTS MUST BE TESTED IN A VACUUM Vacuum SpinTesting © is required, because it prevents the build-up of temperatures in the part — due to air friction. In the vacuum, the test can be conducted with a relatively low horsepower driving source, and on a much quicker operating cycle . . . thus making possible the testing of turbine rotors, axial flow compressors and similar parts as they come off the assembly line.

Only in this way, by WARREN VACUUM SpinTesting ©, can you ever be **sure** of the absence of vibration in these rotating parts that are to be used under extremely critical conditions.

With Warren Vacuum High Speed Testing equipment, tests of jet engine parts and accessories are conducted in accordance with procedures established by the Air Force or the Navy Bureau of Aeronautics.

Pioneering in this field, 27 large-scale installations of Warren Vacuum High Speed Testing Units have already been made in various manufacturing plants and Air Force bases throughout the U. S.

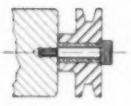
Write for literature **which describes this equipment, now available in three sizes:**

VHS-1	for parts up to 55" dia. weighing up to 2500 pounds, to SpinTest © up to 25,000 rpm.
VHS-2	for parts up to 40" dia. weighing up to 200 pounds, to SpinTest © up to 60,000 rpm.
VHS-3	for parts up to 15" dia. weighing up to 15 pounds, to SpinTest © up to 100,000 rpm.

WARREN BROTHERS MANUFACTURING DIVISION
WARREN BROTHERS ROADS COMPANY
32 POTTER STREET • CAMBRIDGE 42 • MASSACHUSETTS

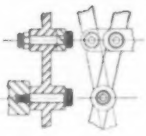
- DESIGNING
- ENGINEERING
- MANUFACTURING

UNBRAKO Shoulder Screw Applications



1. Stationary Shaft or Pivot

A. Idler pulley
B. Idler gear
C. Circular form tool
D. Lever, crank or linkage arm
E. Cam
F. Latch



2. Moving Shaft or Pivot

A. Linkage bar connection
B. Cam
C. Cam follower
D. Ratchet
E. Planetary gear or pinion

UNBRAKO SHOULDER SCREWS...
uniform, standardized, precision threaded
industrial fasteners...HAVE NUMEROUS APPLICATIONS

You can use these UNBRAKO Socket Head Shoulder Screws as stationary shafts or pivots, moving shafts or pivots, stationary guides, and for stripper plate and pressure pad applications. These UNBRAKO screws have shoulders held to close tolerances, finished threads close to the shoulder, and threads and heads concentric with the body. Write for descriptive literature. STANDARD PRESSED STEEL Co., Jenkintown 1, Pennsylvania.

UNBRAKO SOCKET SCREW DIVISION

3. Stationary Guide

A. Locating pin in jigs and fixtures
B. Latch stop
C. Alignment of stationary members
D. Linkage block
E. Grooved cam
F. Adjusting block

4. Stripper Plate Uses

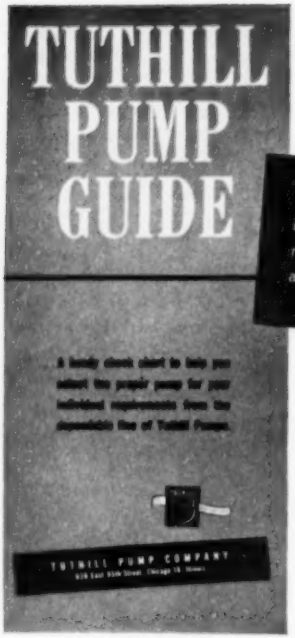
A. Blanking dies
B. Compound dies
C. Progressive compound dies
D. Drawing dies
E. Redrawing dies
F. Piercing and shearing dies
G. Combination blanking, drawing and piercing dies
H. Double action blanking and drawing dies

5. Pressure Pad Uses

A. Cutting-off dies
B. Bending dies
C. Bending and forming dies
D. Assembly dies
E. Double action blanking and drawing dies

SPS
JENKINTOWN PENNSYLVANIA

When You Need Pump Replacements...



Let this TUTHILL PUMP GUIDE Save You Time and Trouble.....

There's a Tuthill positive displacement internal-gear rotary pump to meet your needs in lubrication, hydraulic, coolant, and liquid transfer service.

To help you select the right pump for your replacements, Tuthill offers this handy, letterhead-size reference chart. It shows the Tuthill pumps available for each type of service, complete with capacities, pressures, speeds, packing, mounting and exclusive performance features. It makes the job of picking the right pump easier than ever before. It saves you time, work and trouble.

Write for your Tuthill Pump Guide today!

TUTHILL PUMP COMPANY
939 East 95th Street, Chicago 19, Illinois

From the *American Machinist* Library of *Tips for Top Shop Men*

SLAVERY was not abolished by Lincoln. He did end physical slavery, but man himself must end mental slavery to habit. Education will help, but the real problem is to breed a race of open-minded, inquiring men who welcome the chance to wonder, to question and to analyze—then to take a chance on a new idea that looks sound.

PROCEDURE for methods improvement: Pick an operation to be improved. Put down in writing what happens—the details. Challenge each detail in order. Where a chance for improvement appears, develop the better method. Apply it on the job.

All the basic facts your NEW MEN need to know about Inspection Tools...

KNOW YOUR

Inspection Tools

12 pages — 20 cents a copy

This *American Machinist* Special Report, the latest in our series of defense training manuals, will help your new men to understand the common gages used for production inspection . . . what they are, how to use them, and how to care for them.

The report is intended primarily for men who have had little experience with inspection problems, but even your trained inspectors will find it useful as a refresher course.

Equally useful Special Reports on the following related subjects are also available:

KNOW YOUR MEASURING TOOLS
12 pages — 20 cents a copy

KNOW YOUR HAND TOOLS
12 pages — 20 cents a copy

OPTICAL TOOLS FOR SHOP PRECISION
8 pages — 15 cents a copy

READER SERVICE DEPARTMENT

American Machinist
McGraw-Hill Building
New York 36, N. Y.

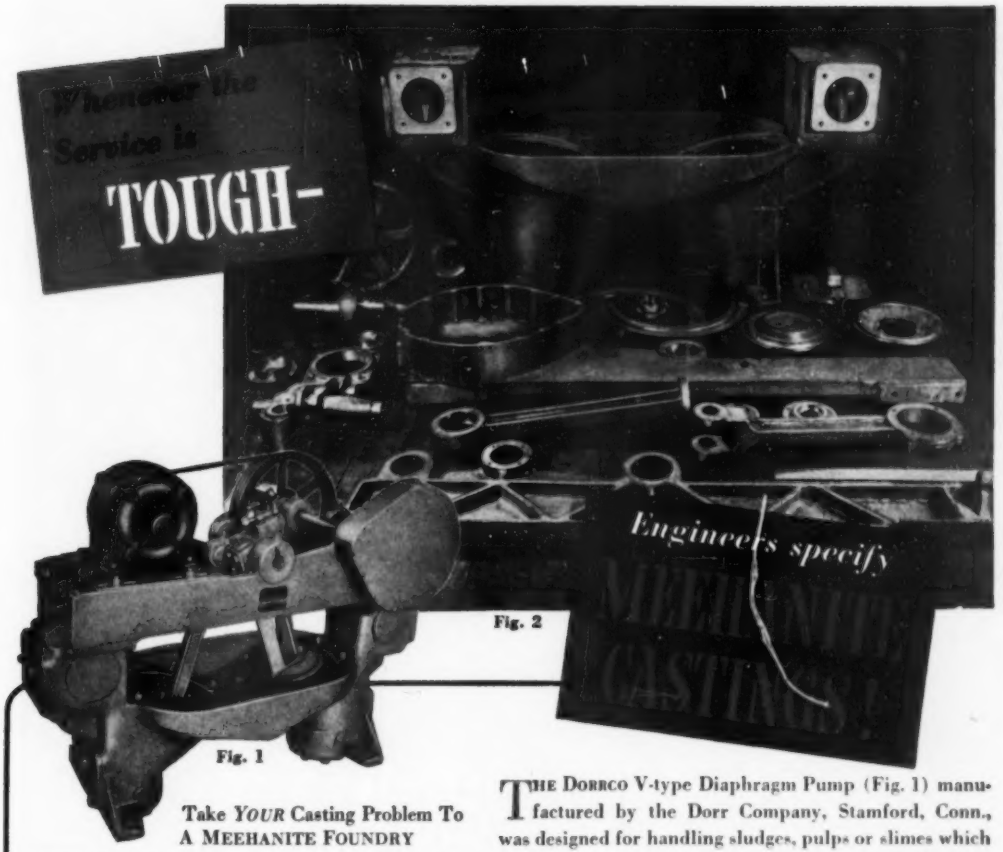


Fig. 2

Fig. 1

Take *YOUR* Casting Problem To A MEEHANITE FOUNDRY

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Canton, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
Hardinge Manufacturing Co.	York, Pennsylvania
Johnstone Foundries, Inc.	Grove City, Pennsylvania
Kanawha Manufacturing Co.	Charleston, West Virginia
Lincoln Foundry Corp.	Los Angeles, California
E. Long Ltd.	Orillia, Ontario
Otis Elevator Co., Ltd.	Hamilton, Ontario
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
Rosedale Foundry & Machine Co.	Pittsburgh, Pennsylvania
Ross-Meehan Foundries	Chattanooga, Tennessee
Shenango-Penn Mold Co.	Dover, Ohio
Smith Industries, Inc.	Indianapolis, Ind.
Standard Foundry Co.	Worcester, Massachusetts
The Stearns-Roger Manufacturing Co.	Denver, Colorado
Traylor Engineering & Mfg. Co.	Allentown, Pennsylvania
Valley Iron Works, Inc.	St. Paul, Minnesota
Warren Foundry & Pipe Corporation	Phillipsburg, New Jersey

"This advertisement sponsored by foundries listed above."

THE DORRCO V-type Diaphragm Pump (Fig. 1) manufactured by the Dorr Company, Stamford, Conn., was designed for handling sludges, pulps or slimes which contain sizable quantities of solid material. In keeping with their international reputation as builders of dependable and efficient equipment, designed to provide better service life under severe operating conditions, the Dorr Company regularly designs to and specifies Meehanite engineering characteristics.

Note that the Meehanite castings (Fig. 2) used in this specific unit reveal the fact that every major component is a Meehanite casting. These castings provide the necessary strength, toughness and resistance to wear and corrosion demanded by the service functions of such a pump.

Write for our new 20-page Pump Bulletin No. 36 which gives complete details not only on pump applications but various specific property tests as applied to impact, erosion, corrosion and wear.

MEEHANITE®

NEW ROCHELLE, N. Y.

ERIE HAMMERS

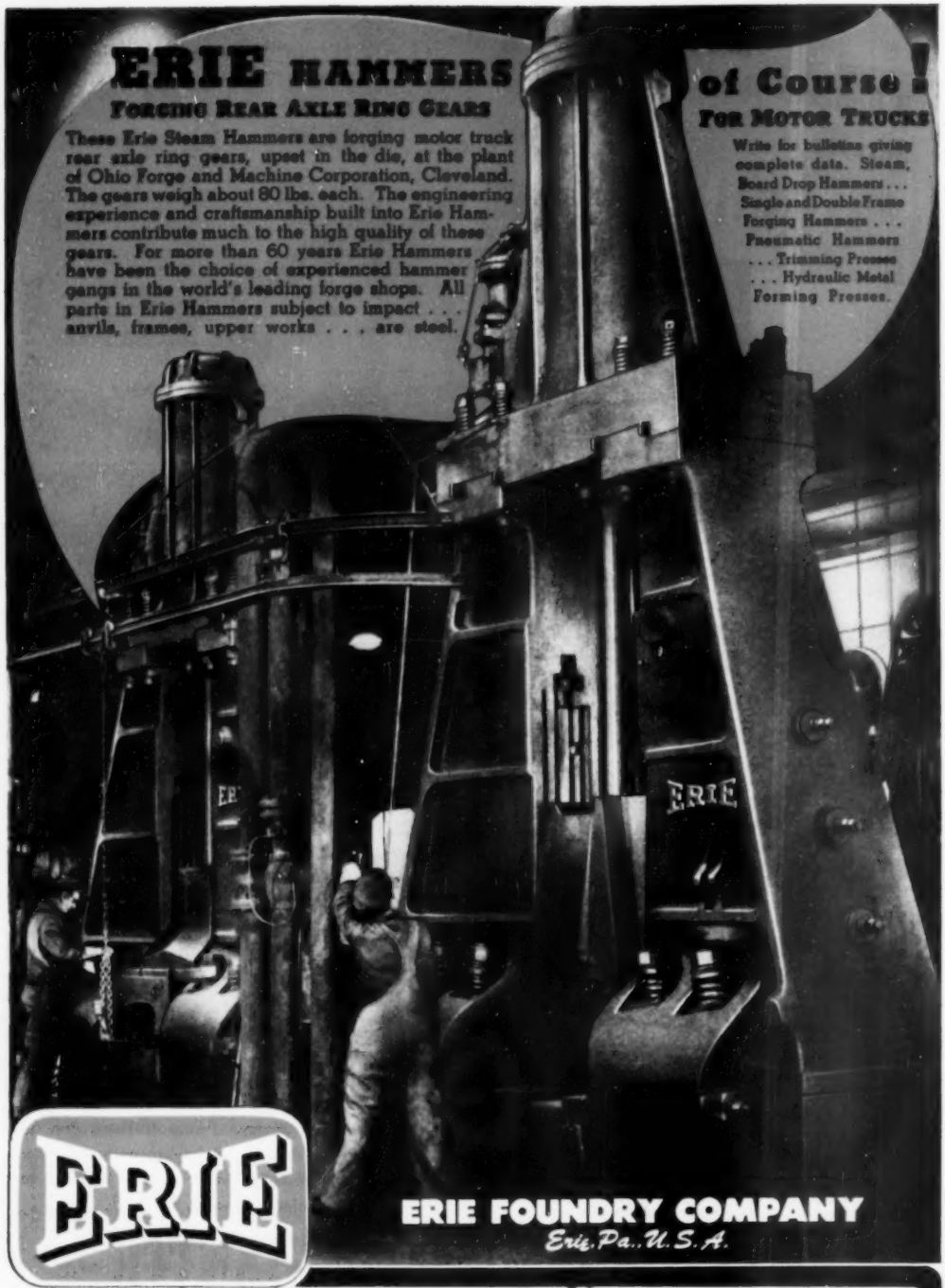
FORGING REAR AXLE RING GEARS

These Erie Steam Hammers are forging motor truck rear axle ring gears, upset in the die, at the plant of Ohio Forge and Machine Corporation, Cleveland. The gears weigh about 80 lbs. each. The engineering experience and craftsmanship built into Erie Hammers contribute much to the high quality of these gears. For more than 60 years Erie Hammers have been the choice of experienced hammer gangs in the world's leading forge shops. All parts in Erie Hammers subject to impact . . . anvils, frames, upper works . . . are steel.

of Course!

FOR MOTOR TRUCKS

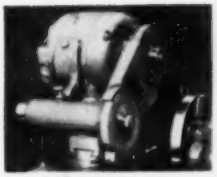
Write for bulletins giving complete data. Steam, Board Drop Hammers . . . Single and Double Frame Forging Hammers . . . Pneumatic Hammers . . . Trimming Presses . . . Hydraulic Metal Forming Presses.



ERIE

ERIE FOUNDRY COMPANY
Erie, Pa., U.S.A.

ERIE BUILDS *Dependable* HAMMERS



External Grinder

Milling Attachment

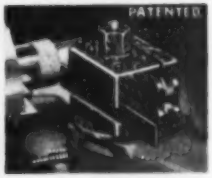
Handlever Tailstock

Handlever Bed Turret

Telescopic Taper Attachment

Handwheel Collet Attachment

Handlever Collet Attachment



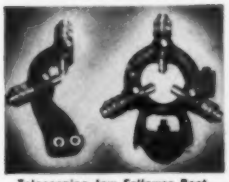
10 in 1 Tool Holder

Ball Bearing Live Center

Adjustable Collet Bushing Chuck

Square Turret Tool Block

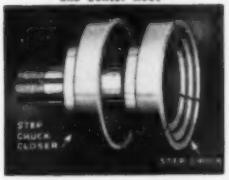
Handlever Double Tool Cross Slide



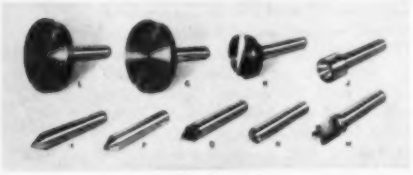
Telescoping Jaw Follower Rest and Center Rest

Collet Rack

Steel and Brass Collets

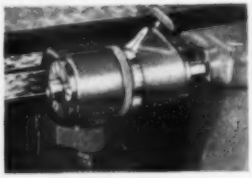


Step Chucks and Closers

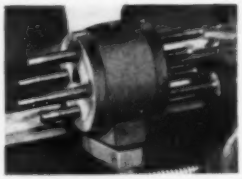


Centers and Drill Pads

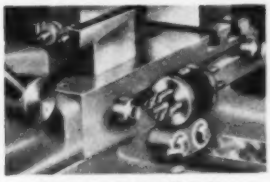
Thread Dial Indicator



Micrometer Carriage Stop



Four Position Carriage Stop



Four Position Cross Slide Stop

Safety and Standard Lathe Dogs

Coolant Pump

Universal Table

SOUTH BEND

Lathe Attachments

- Cut Production Time
- Simplify Difficult Jobs
- Increase Lathe Versatility
- Speed Up Tooling
- Perform Special Classes of Work
- Reduce Operator Fatigue

Write for Catalog 5102

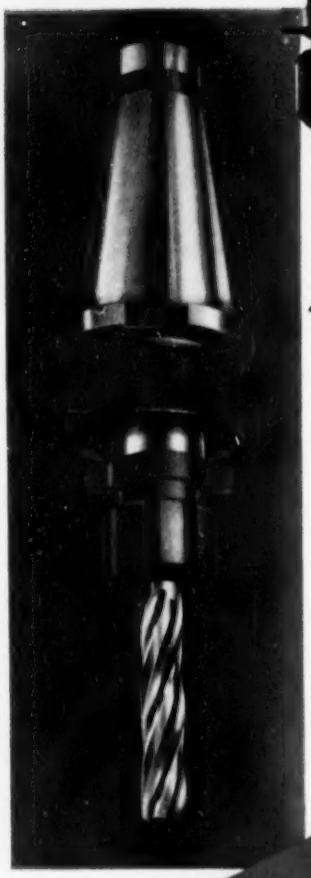
SOUTH BEND LATHE

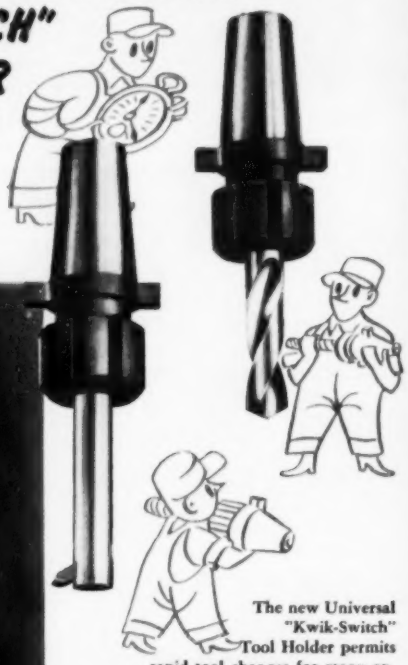
Building Better Tools Since 1906

SOUTH BEND 22, INDIANA

NEW INGENIOUS UNIVERSAL "KWIK-SWITCH" TOOL HOLDER

permits 10-second tool changes without accuracy losses





The new Universal "Kwik-Switch" Tool Holder permits rapid tool changes for many operations, such as drilling, reaming, and boring on mills, radial drills, and other machines and still maintains accuracy and rigidity not ordinarily found in tools of this type. The Universal "Kwik-Switch" Tool Holder consists of a Master Chuck and several Adapter Chucks. Each tool is inserted in its Adapter Chuck and set to proper length and tightened. The Adapter Chuck is then easily locked or unlocked by hand in the Master Chuck by less than a half turn of the locking nut. Tools are thus interchanged in a fraction of the time ordinarily required in similar operations.

Precision manufacture throughout insures the accuracy of the "Kwik-Switch" Tool Holder. It is made of hardened and ground steel and held to the same exacting standards which have made the Universal Collet Chuck a favorite of industry. Universal "Kwik-Switch" Tool Holders handle tools with either straight or taper shanks. The Master Chuck is available in straight and taper shanks to fit all standard machine tools. Send for complete information.

Facilities available for special hardened and ground precision parts made to customer specifications.

Precision + Speed + Power

. . . THIS VERSATILE MACHINE CAN REPLACE 2 OR MORE SINGLE-PURPOSE MACHINES

KNIGHT'S NO. 50

Vertical Milling & Precision Boring Machine

Here is combined in a single solid-base machine every essential feature for milling and accurate boring—with ability to accomplish an extreme range of difficult or unusual work invariably done on two or more machines.

Work transfers are entirely eliminated
Set-up time is reduced to a minimum

Table feeds from 5/16" to 20" per minute plus rapid traverse in all directions. There are 16 Spindle speeds from 40 to 2000 r.p.m. and infinitely variable boring feeds from .0005" to .010".

Convenient quick-action controls—full-vision work areas—easy operation. Powerful all-gear 7½ H.P. drive—extra-rugged construction.

Write For Catalog

ATTACH TO COMPANY LETTERHEAD

W. B. KNIGHT MACHINERY CO.
3920 W. Pine Blvd., St. Louis 8, Mo.

Send catalog on No. 50 and other Knight Milling Machines.

Name.....

Title.....

☐ Send information on Knight's 20" and 42" Rotary Tables.

KNIGHT
VERSATILE · MILLERS · ACCURATE · RIGID

W. B. KNIGHT MACHINERY CO.
3920 WEST PINE BLVD. • ST. LOUIS 8, MISSOURI

The New – ARTHUR KLINK

HYDRAULIC

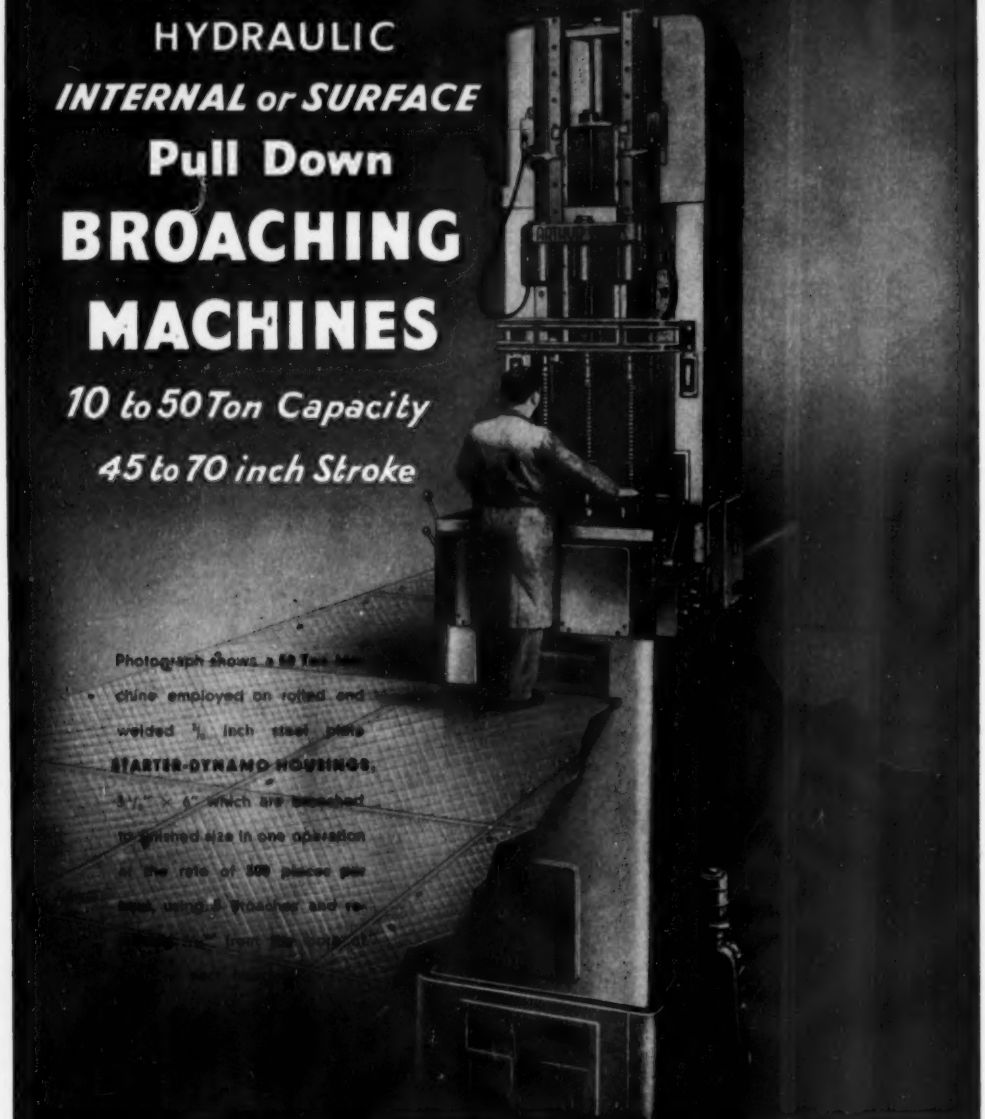
INTERNAL or SURFACE

Pull Down

BROACHING MACHINES

10 to 50 Ton Capacity

45 to 70 inch Stroke



Photograph shows a 50 Ton ... chine employed on rolled and ... welded ½ inch steel plate STARTER-DYNAMO HOUSINGS, 3½" × 6" which are broached to finished size in one operation at the rate of 300 pieces per hour, using 4 broaches and re- ... from the ...

BROACHING MACHINES AND BROACHES

ARTHUR KLINK G.M.B.H. NIEFERN BADEN - GERMANY

NOW HE KNOWS IT'S RIGHT. He could be a final or process inspector, a foreman or a tapping machine operator — anyone at a key point on the production line.

But, he could also know when all is **not** well. This gage could warn of a dull tap, a drill going wrong, misalignment in a set up. All these and other faults can be detected by proper gaging.

Know that it's right. Prevent waste. Use good gages!

GREENFIELD TAP and DIE CORPORATION

GREENFIELD, MASSACHUSETTS

GEO MET RIC C

self-opening die head

for right hand threading on hand operated machines

Style C

SPECIFICATIONS STYLE C WITHOUT LATERAL FLOAT [illegible]-OFF TRIP

Style and Chaser Number	Construction Number	CAPACITY				Code Word	A	B	C	D			SHANKS					
		Straight Threads			Standard Pipe Threads								Standard		Also Available			
		Diam. Inches	Lgth.	Coarsest Pitch											‡Max.		△Min.	
													Dia.	Lgth.	Dia.	Lgth.	Dia.	Lgth.
C-1 ⅛	12678-K	⅝" to 1 ⅛"	2"	8	⅛"– ¼"	Cameo	3 ⅛"	3"	1 ⅝"	1⅝"	1 ⅛"	1 ⅜"	1 ¼"	3 ¼"	1 ½"	3 ½"	1"	1 ½"
C-1 ¼	A6393-D	¼" to 1 ⅜"	2"	8	⅛"–1 ¼"	Center	4 ½"	3 ½"	2⅛"	1⅛"	1⅛"	1⅛"	1 ¼"	4"	2 ½"	4"	1 ½"	2"
C-2 ¼	A5167-J	1 ¼" to 2 ½"	2 ¼"	8	1" –1 ½"	Canvas	4⅛"	3⅛"	2⅜"	2⅛"	1⅛"	1⅛"	2"	4 ½"	2 ½"	4 ¼"	1 ½"	2"
C-2 ½	20504-P	1 ½" to 2 ½"	2"	8	1 ¼"–2"	Carte	5 ¼"	3 ½"	2⅛"	2⅛"	1 ½"	1 ½"	2 ¼"	4 ½"	2 ½"	4 ½"	1 ¼"	2"
†C-2 ½	12744-D	1 ¼" to 2 ½"	3 ½"	7	1" –2"	Carmine	5 ¼"	4⅛"	2⅛"	2⅛"	1 ½"	2 ½"	2 ¼"	4 ¼"	3"	4 ½"	1 ½"	2 ¼"
C-3	30123-H	1 ½" to 3"	2 ½"	8	1 ¼"–2"	Catch	5 ⅛"	3 ½"	3 ½"	3⅛"	1 ½"	1 ¾"	2 ¼"	4 ½"	3 ½"	4 ½"	1 ½"	2 ¼"
†C-3 ¼	93271-R	2 ½" to 3 ¼"	2 ½"	8	2"	Cement	6 ½"	3 ½"	4⅛"	3⅛"	1 ½"	2 ½"	2 ½"	5"	4 ½"	5"	1 ¾"	2 ½"
†C-4 ¼	49270-C	2 ¼" to 4 ½"	3 ½"	7	***2 ½"–4"	Certain	8 ½"	5 ¼"	5 ½"	4⅛"	1 ½"	2 ½"	2 ¾"	5 ½"	5"	5 ½"	2"	3"
†C-6	28831-E	3 ½" to 6"	3 ½"	7	***3" –5"	Chouk	11"	5 ¼"	6 ½"	6 ¼"	1 ¼"	3"	3"	5 ¼"	5 ½"	5 ½"	2 ½"	3"

‡Other sizes can be furnished where required. Price quoted on specific inquiries.
†These Die Heads are fitted with Roughing and Finishing Attachment.
*Length that can be cut when shank is solid.
***Projection Chasers required for pipe sizes within listed capacities.

‡Maximum shank without bushing.
△Minimum recommended size.

GEOMETRIC TOOL COMPANY DIVISION

Greenfield Tap and Die Corporation

NEW HAVEN 15, CONNECTICUT

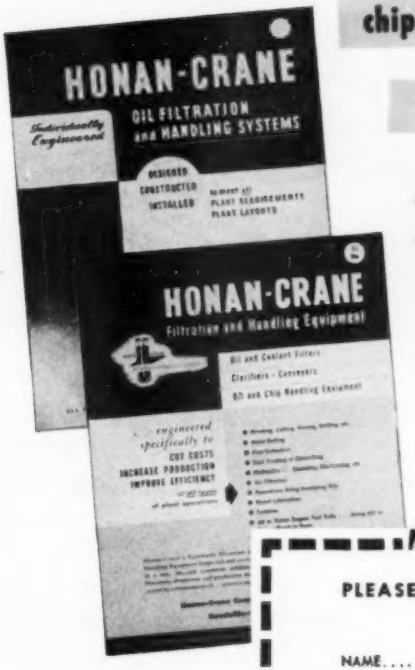
What's Your Problem?

oil or coolant filtration and handling?

filtering systems for jet or piston-engine test cells?

chip, abrasive or other waste removal?

raw materials handling?



Honan-Crane has the Right Solution

These two folders tell how dependable Honan-Crane equipment solves your filtration and handling problems and pays for itself out of savings; they give full information about Honan-Crane Engineering Service and production facilities for special installations. Get your copies NOW!

Mail This Coupon for Your FREE Folders

PLEASE SEND ME FREE FOLDERS DESCRIBED ABOVE.

NAME.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

Honan-Crane Corp., 205 Wabash Ave., Lebanon, Indiana

A Subsidiary of **Houdaille-Hershey Corp.**

IN CANADA: E. W. Playford, Ltd., Montreal 28; W. E. Micklethwaite, Toronto 18; Cummings Galbraith, Ltd., Edmonton, Alta.

All Honan-Crane Equipment is Sold on Performance-Guaranteed Basis

WORLD'S LEADING OIL FILTER MANUFACTURER

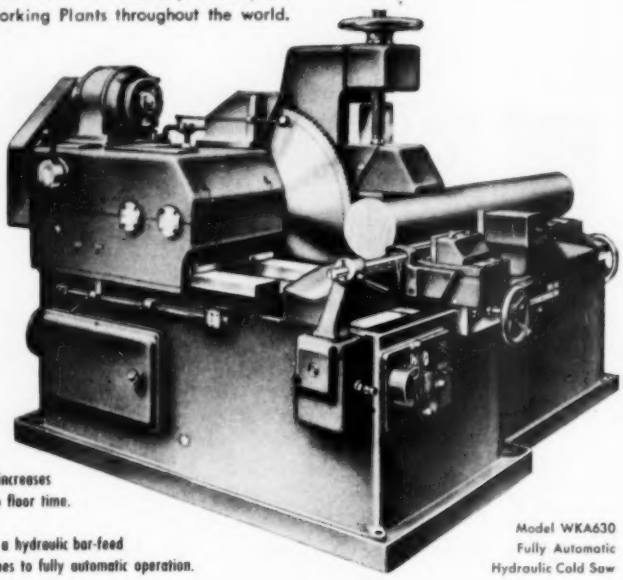
Wagner Hydraulic COLD SAWS

for Semi-Automatic Fully Automatic CUTTING

The dependability and efficiency of Wagner Cold Saws have been proven by the thousands of machines installed in Metal Working Plants throughout the world.

Features for Dependable Performance

- **TWO POINT DRIVE**—The double worm gear transmits power through helical gears to two points on the saw arbor. This two point contact withstands the heaviest stresses of constant operation.
- **HYDRAULIC FEEDS**—All operations are hydraulically controlled. The infinitely variable feed protects the saw blade against overload—even with the heaviest cuts. The pressure adapts itself automatically to the varying thickness of the cross section and hardness of the work piece.
- **SEMI-AUTOMATIC OPERATION**—After the work is in position, only the movement of a single lever controls the cycle of operation—clamping—feeding—rapid return motion—release. This feature increases safety, makes machine fool-proof and reduces floor to floor time.
- **FULLY AUTOMATIC OPERATION**—Incorporating a hydraulic bar-feed into the hydraulic system easily converts these machines to fully automatic operation.



Model WKA630
Fully Automatic
Hydraulic Cold Saw

Wagner Cold Saws for Your Cutting Operations

SEMI-AUTOMATIC		WK500	WK630	WK800	WK1000	WK1250
Maximum Cuts	● Rounds	8"	10½"	13½"	16½"	21¼"
	I Beams	16" x 6"	20" x 6½"	24" x 7½"	24" x 7½"	24" x 7½"
FULLY AUTOMATIC		**WKA500**	**WKA630**	**WKA800**		
Maximum Cuts	● Rounds	7"	8½"	11½"		
	I Beams	15" x 6"	19" x 6½"	23" x 7½"		

All machines can be equipped with Mitre Vises for cutting mitres up to 45°

Write for Bulletin 39b fully describing these Cold Saws

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

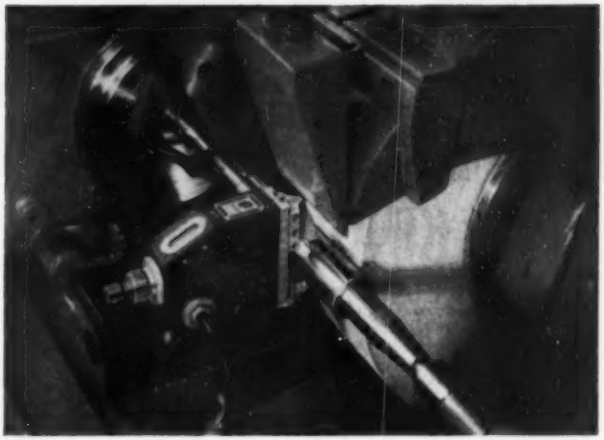
Fortuna Cylindrical Grinders

Plain and Universal Types

for

External
Internal
Form
Multi-Wheel
Profile

GRINDING



Finitor Automatic Sizing and Measuring Instrument, mounted on Fortuna Grinder, automatically controls grinding operations and holds size tolerances up to .00004".

Fortuna Grinders, for plunge cut or traverse grinding, are made in several types and sizes to accommodate workpieces up to 23½" diameter and 88" between centers . . . To increase production efficiency these hydraulically operated machines have single lever control for all operations of a pre-determined set-up . . . Numerous attachments are available to increase production and simplify grinding operations . . . For extremely accurate work, the grinders can be equipped with FINITOR Automatic Sizing and Measuring Instruments that automatically control the grinding operations and hold size tolerances up to .00004".

Type ES630 Fortuna Cylindrical Grinder

Send us the details of your grinding jobs. Cosa engineers will recommend the proper Fortuna Grinder. Or, write for Catalog.

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

Simplify LARGE HOLE Tapping

with the New Procunier

TAP KING

This lightweight, heavy duty tapping attachment was designed especially for difficult large hole tapping. Rugged, dependable, with a super-tap capacity of ⅜" to 1" in steel and up to 1⅛" in softer materials, the Tap King has been establishing production records. Many users report 50% production increases on large hole tap jobs and costly parts spoilage practically eliminated! And these are not isolated cases! Other users claim more **spectacular** daily production gains. Production men report amazing savings in parts spoilage and consistent, more accurate maintenance of uniform tap depth—even on large **blind hole** tapping jobs! Check these unique features:

Exclusive 17 tooth spline drive from clutch to tap holder spindle, gives smooth, powerful drive, increases tapping accuracy and reduces strain, wear and vibration; new, sensitive yet powerful friction clutch drives tap smoothly, with finger tip control — drastically reducing operator fatigue resulting in more work in less time with less effort; ball and needle bearings assure longer, trouble-free life; reverse speed is twice forward speed; simplified oiling system; aluminum housing; PLUS many other unusual features.

NEW! LARGER!
"TRU-GRIP" Tap Holder
Makes tapping easier close to walls or shoulders, eliminates "chewed" tap shanks. Lighter, smaller in diameter, it drives the tap by the square, holds it true by the round.

Procunier
Safety Chuck Company
14-18 S. Clinton St., Chicago 6, Ill.

PROCUNIER SAFETY CHUCK CO.
14-18 S. Clinton St., Chicago 6, Ill. Dept. 11

Gentlemen: Please send me full details on the new Procunier "TAP KING" Heavy Duty Tapping Attachment.

Name _____

Address _____

City _____ Zone _____ State _____

From the *American Machinist* Library of *Tips for Top Shop Men*

SOME wag said long ago that it isn't smart to step on other men's hands as you go up the ladder—you may need their help coming down. It's just as true that the man who makes his way up by slipping a knife in the back of the man above, spends his time up there ineffectually because he's always got one eye cocked over his shoulder, watching for the knife.

How efficient is YOUR shop?

Over 42 per cent of metalworking production equipment is now over ten years of age . . . 19 per cent of it was bought more than 20 years ago!

This means that there is more over-age and obsolete production equipment operating in metalworking shops now than in 1945, and the rate of obsolescence is growing.

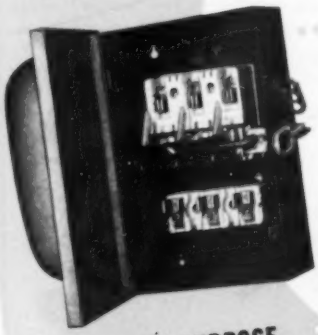
How about your shop? Are you equipped adequately with the modern, high-efficiency machinery and equipment which alone can produce the better products that cost *less* to buy which everybody wants? How does your shop compare with those of your competitors, and with metalworking shops generally?

You can find out quickly by writing for a copy of the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment. Here are all the facts on the age and number of 155 major types of production equipment, operating in 15 manufacturing divisions and 25 major production areas. Price: $2.00 per copy.

American Machinist
Reader Service Department
McGRAW-HILL BUILDING
NEW YORK 36

3 LINES OF SAFETY SWITCHES *for* 3 DIFFERENT MARKETS

one line can't do two or three jobs without compromising price and performance!



GENERAL PURPOSE

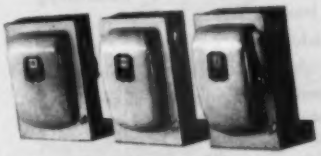
90,000 line designed for residential, commercial and other applications where price is limiting and the service factor is not great.

INDUSTRIAL

40,000 line designed for general industrial or institutional and commercial applications where the service factor is greater and price is an important consideration. MEETS BOTH GOVERNMENT AND NEMA SPECIFICATIONS FOR TYPE A SWITCHES.

HEAVY-DUTY INDUSTRIAL

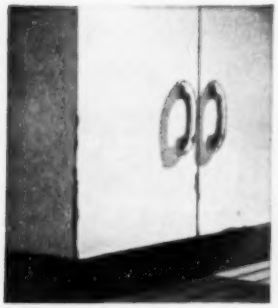
80,000 and 50,000 line designed for mass production industries where price is secondary to continued performance under conditions of severe service and maximum safety. The 50,000 line is used where space is limited. BOTH ARE TYPE A but go far beyond those requirements.

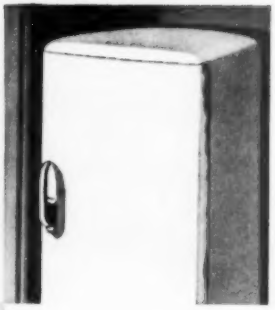


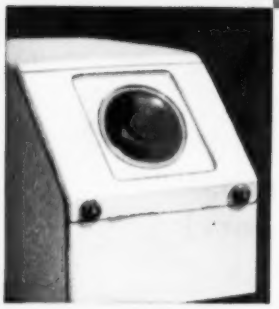
UNIFORM STYLING

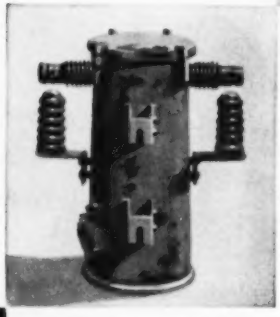
ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY









PAINT FAILURE *can wreck your product's reputation!*

... better use BONDERITE under the paint

Appearance counts heavily in the public's judgment of your product. Not only how it looks when new, but how it looks after years of service . . . Bonderite, under the paint of your metal products, can make the difference between a "thumbs up" and a "thumbs down" judgment.

Bonderite, Parker's corrosion resistant paint base, preserves the good looks of the nation's finest painted metal products. By creating a tight coating of nonmetallic phosphate integral with the metal, it gives paint a secure anchor, resists corrosion and prevents the spread of finish failure if the paint is accidentally scratched or broken.

Bonderite adds value out of all proportion to its cost.

Your painted metal product should have Bonderite-protection. Write today for full information.

*Bonderite, Bonderlube, Parco, Parco Lubrite — Reg. U.S. Pat. Off.

PARKER RUST PROOF COMPANY

2196 E. Milwaukee Ave., Detroit 11, Michigan

FIRST in the field since 1915

BONDERITE—corrosion resistant paint base

BONDERITE AND BONDERLUBE aids in cold forming of metals

PARCO COMPOUND rust resistant

PARCO LUBRITE—wear resistant for friction surfaces

PRECISION ...pays for itself...on

Precision, based upon Herman Stone pink granite surface plates, pays for itself by reducing rejects as much as 80% . . . by cutting losses due to spoiled materials . . . by increasing productive output.

Only granite provides permanent precision—and only Herman Stone provides pink granite surface plates with maximum wearability and uniform, overall accuracy within tolerances as low as 50 millionths of an inch.

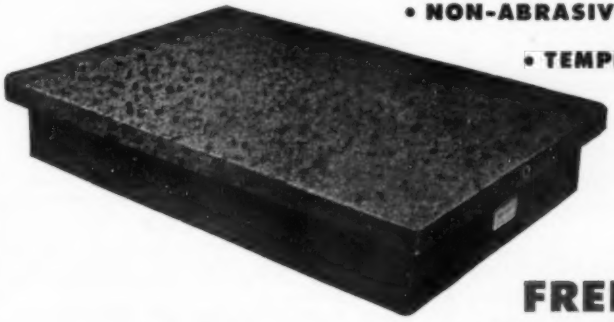
Now is the time to replace worn cast iron plates, to insure utmost accuracy in your precision measurement operations. You'll be pleasantly surprised at the low cost of Herman Stone granite surface plates (many models actually cost less today than in 1941) . . . you'll be equally pleased with our prompt deliveries (many models shipped direct from stock).

Write today (see coupon below) for complete information about free trial-test offer.

HERMAN STONE

PINK GRANITE SURFACE PLATES

- **WILL NOT WARP**
- **WILL NOT RUST**
- **NON-ABRASIVE**
- **NON-MAGNETIC**
- **TEMPERATURE-RESISTANT**
- **IMMEDIATE DELIVERY on most stock sizes**
- **PLATE SIZES FROM 8″ x 12″ to 12′ x 20′**



FREE TRIAL OFFER!

The Herman Stone Co.

THE FIRST...AND THE FINEST ...GRANITE SURFACE PLATES

START SAVING NOW . . . mail this coupon TODAY!

Mr. R. A. Mayne, Sales Manager
The Herman Stone Co.
324 Harries Bldg.
Dayton 2, Ohio

TRIAL-TEST a HERMAN STONE CO. GRANITE SURFACE PLATE in your plant—without obligation

Dear Mr. Mayne:

Tell me how I can trial-test one of your granite surface plates in our plant, without any obligation, to prove it will pay for itself.

NAME TITLE

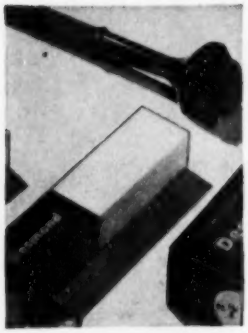
COMPANY

ADDRESS

CITY ZONE STATE

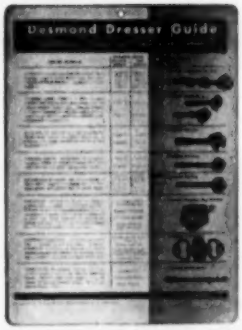
use these aids

FOR BETTER GRINDING



1 Genuine Desmond Cutters

For best wheel dressing results and longest cutter life, ask for Desmond cutters and replacement parts by name: High carbon steel cutters are accurately milled and carefully heat treated for maximum hardness. Quickly identified by the easy-to-read Desmond labels.



2 Desmond Dresser Guide

For maximum grinding production keep all your grinding wheels properly dressed with the right Desmond dresser. Handy 9" x 12" Dresser Guide for tool cribs and grinding departments help you select the right tool for every job. Free on request. Ask your Industrial Distributor.

3 Qualified Desmond Distributors

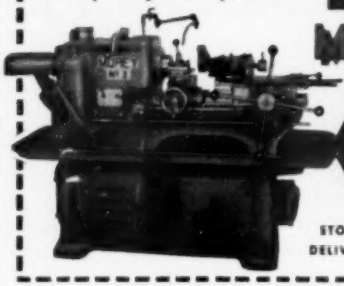
Your nearby Desmond distributor knows your local needs and has the technical data and know-how to insure best results. Have your distributor fill out the Desmond Dresser Survey Form for factory recommendations of dresser and cutter for your grinding application. THE DESMOND-STEPHAN MFG., CO., URBANA, OHIO.

Desmond

DRESSERS & CUTTERS

For Ease, Economy and Simplicity of Operation

DEPEND ON THE **MOREY**



No. 2 TURRET LATHE

STOCK DELIVERY

Designed to take full advantage of tungsten carbide tools, the modern MOREY Turret Lathes are ruggedly and heavily built for continuous duty, maintaining close tolerances. New methods of speed and feed control are incorporated, permitting even the inexperienced operator to select almost instantaneously the speed and feed best suited to the work . . . Ideal for both bar and chucking operations.

Sales territories open

PARTIAL LISTING OF SPECIFICATIONS:

Bar work capacity	1" dia. x 6"
Chucking capacity	8" dia.
Swing over bed	14"
Hole through spindle	1-9/32"
Spindle speeds (Back gear ratio)	60-2000 RPM inf. variations with constant speed, AC 1800 RPM motor 1.5:1
Motor	3 HP

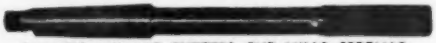
Write us today for complete details!

MOREY *for machine tools!*

MOREY MACHINERY CO., Inc.
Manufacturers • Merchants • Distributors
410 BROOME STREET • NEW YORK 13, N. Y.

ATTENTION REAMER BUYERS

70 YEARS CHOICE OF TOOL EXPERTS



REAMERS, MILLING CUTTERS, END MILLS, SPECIALS

ALVORD-POLK TOOL CO. Millersburg, Pa.

DON'T SCRAP IT!

Ever have a tap or drill break in an expensive part? . . . so that even careful drilling couldn't save it? Today, parts costing as little as 50c can be economically salvaged by an Elox Electron Drill.* They're real money savers! No plant can afford to be without one. Write for particulars.

Elox Corporation of Michigan

740 N. Rochester Rd. *T.M. Reg. Clawson, Mich.

RANDALL and STICKNEY Dial Gauges and Indicators

Model C 50 B

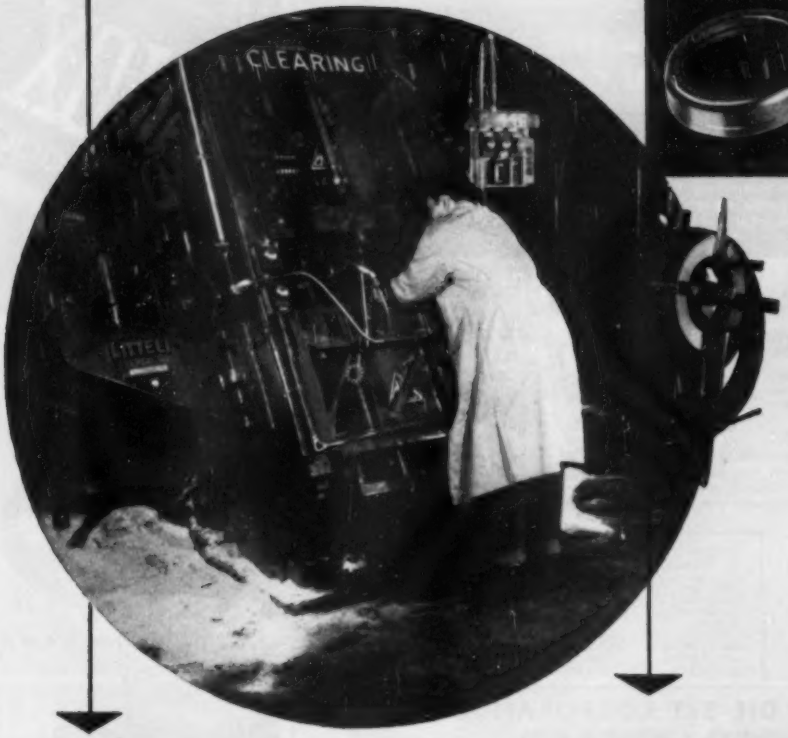
are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2¼" overall diameter, balanced dial 0-25-0 with .0005" graduations, ⅛" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gauges Since 1896



BEARING DOWN ON PRODUCTION

This Clearing press at Aetna Ball Bearing & Roller Co. is equipped with automatic feed and combination die so that every press stroke delivers a completed piece. Production on this basis brings costs right down to bedrock.

Just as important as speed of production is the *precision* with which the press operates. That's a big reason why Aetna chose the Clearing for this spot. Accurate, uniform output at top speed results in a really quality product without getting unreasonable costs.

Clearing presses can improve your production picture, too. Why don't you get in touch with us? It won't cost you anything to find out the facts.

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET ★ CHICAGO 38, ILLINOIS

HAMILTON DIVISION, HAMILTON, OHIO

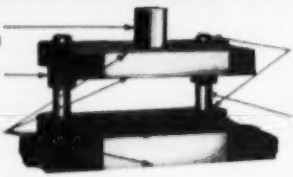
CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

YOU PAY FOR THE BEST . . .
BE SURE YOU GET THE BEST

FACTORY-BUILT IS BETTER-BUILT

When you specify "Detroit" die sets, you are assured micro-metric precision that means: 1) Lower costs in mounting die in die set and 2) Longer, trouble-free production runs. Factory-built die sets give you what you pay for—parallelism, squareness, and finish.


Shanks cast on, inserted or welded
"Detroit" bushings are full-bearing
Parallel surfaces held to exceptionally close limits
Leader pin holes and bushing holes are micro-metric jig bored
"Detroit" precision leader pins are superfinished

Factory-built to the most exacting standards, "Detroit" die sets are also factory-assembled and factory-inspected. You don't have to re-work "Detroit" die sets in your shop to get the accuracy and performance you have a right to expect.

For prompt factory delivery, call "Detroit"

DETROIT	TR 2-5150	MINNEAPOLIS	PR 1822
BIRMINGHAM, ALA.	3-1341	MONTREAL, CAN.	WI 1186
BUFFALO	PA 9206	NASHVILLE	7-0437
CHICAGO	PU 5-7694	NEWARK	MA 2-4318
CINCINNATI	HU 7775	ORLANDO, FLA.	2-3747
CLEVELAND	TO-1-0860	PHILADELPHIA	VI 4-4084
DAYTON	HE 3042	PITTSBURGH	LO 1-4011
HAMILTON, CAN.	9-2683	ROCK ISLAND, ILL.	RI. 8-2814
INDIANAPOLIS	HU 5604	ST. LOUIS	FR 6811
LOS ANGELES	AD 7251	SEATTLE	SE 7997
MILWAUKEE	GL 3-7170	TOLEDO	MA 4510

DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

From the *American Machinist* Library of *Tips for Top Shop Men*

GET to know your people *before* you have to get tough with 'em. It's poor policy to make their acquaintance by bawling 'em out. Introduction by insult is no longer a successful management routine.

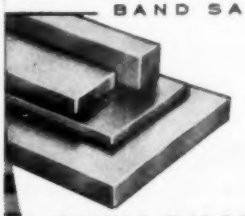
THE old Army slogan, "If it moves, salute it; if it doesn't, pick it up; if you can't pick it up, paint it," can well be adapted for plant use by changing "salute" to "guard" and "paint" to "oil."

LENOX QUALITY TOOLS

High Speed

HACK SAWS

BAND SAWS



GROUND FLAT STOCK

HOLE SAWS

QUALITY LENOX TOOLS

"The Tools in the Plaid Box"

AMERICAN SAW & MFG. COMPANY
SPRINGFIELD, MASS.

ARO AIR TOOLS
Speed Assembly at AUTO-LITE

ARO Tools help Auto-Lite do scores of daily jobs of screw-driving and nut-setting . . . *faster and easier* . . . assembling parts for speedometer and other dash board instruments as well as recording thermometers and gauges and dial indicating thermometers at their LaCrosse, Wis., plant.

See your ARO distributor for an on the job demonstration, or write for new catalog 60.

The ARO Equipment Corp., Bryan, Ohio.
ARO Equipment of Canada, Ltd., Toronto, Ont.

ARO *The Leader!* **AIR TOOLS**

Also . . . LUBRICATING EQUIPMENT . . . HYDRAULIC EQUIPMENT . . . AIRCRAFT PRODUCTS . . . GREASE FITTINGS

THE *Bridgeport* TURRET MILLING MACHINE

Outstanding in Popularity *because* Outstanding in Performance

The Bridgeport Turret Milling Machine has proved itself a tool of exceptional utility, versatility and convenience in countless shops all over the world. . . . Its remarkable acceptance and the continued demand for it mean but one thing . . . this machine definitely fills an important need in metal working . . . a need which grows day by day as new attachments are developed to provide facilities for even greater utility.

Ability to handle today's work on a machine designed for today's needs, suggests that there may be machines in your shop that can be advantageously replaced with the "BRIDGEPORT". If so, you can effect the change at reasonable cost, because the "Bridgeport" price is within the reach of ANY shop. Investigate and see for yourself.

CONDENSED SPECIFICATIONS

8 Spindle Speeds from 80 to 2720 RPM.

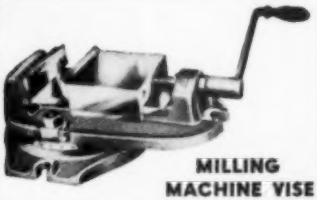
Back Geared Spindle Drive Unit: utilizes full power at all speeds without belt slippage.

Quill Travel: 5".

Power Feed to Quill in 3 steps: .0015, .003 and .006 in. per spindle revolution.

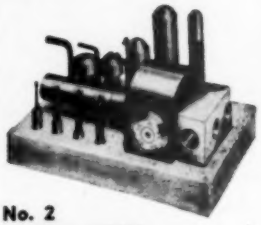
Spindle Brake and Lock for convenience in changing tools.

Collet Capacity: up to ¾" diam.



MILLING MACHINE VISE

An improved vise that provides greater gripping power, is streamlined for appearance and incorporates a coolant trough. A large diameter screw assures rigid holding. Made in two sizes: 5" x 3½" and 6" x 5" jaw openings.



No. 2 BORING HEAD

Boring Tools and Holder provide the means for boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.

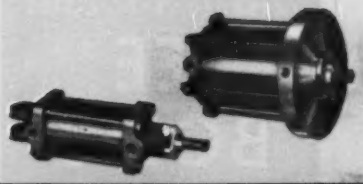
No. 3 HEAVY DUTY RIGHT-ANGLE ATTACHMENT

Designed for milling and drilling at right angles. Can also be used for boring, and reaming, cutting gears, hobs and broaches, sawing and slitting.

Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines



Pneumatic Cylinders

Really complete, the Hannifin line of pneumatic cylinders is made with two types of pistons . . . bores from 1" to 16" . . . six standard mountings. Really standard, these cylinders are tooled to tolerances that assure accurate mounting to make assembly to your machines easier. Really built, each cylinder is "TRU-BORED" and honed, piston rods are ground and polished, interchangeable end caps, heavy duty tie rods . . . rugged, yet precision construction throughout!

Write for Bulletin 210

NOW...

HANNIFIN HAS THE MOST COMPLETE LINE OF AIR CONTROL EQUIPMENT!

NEW! REVOLUTIONARY HANNIFIN *P-M Pilot-Master Valves*

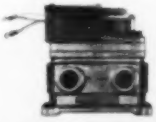
Piston-operated poppet design. Exclusive replaceable cartridge for easier maintenance. Speeds to 600 cycles per minute. Pressure from 15 to 150 p.s.i. Integral, solenoid-controlled pilot heads or a choice of 10 separate pilot valves for remote control.

- Fewer Valves to Stock
- Fewer Parts to Stock
- Maximum Interchangeability
- No Springs in Main Valve

Write for Bulletin 231.

2 and 3-Way Valves.

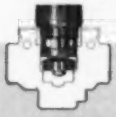
Same valve operates 2-way or 3-way, normally open or normally closed. ⅜" to 1¼" I.P.S.



4-Way Valves.

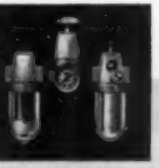
Two 3-way valves mounted in compact, common body. Two piston poppets. Two cartridges. ⅜", ½", ¾" I.P.S.

EXCLUSIVE REPLACEABLE CARTRIDGE



AIR WARDEN

Air filters, pressure regulators and lubricators to protect air operated equipment. Bulletin 10108.



Disc Type Air Control Valves

Designed for smooth, positive and accurate control of air-operated equipment. Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation. Sizes: ⅛" to 1¼" I.P.S.

Write for Bulletin 57-W

Hannifin "Directair" electrically controlled air-operated disc valve

Foot-operated treadle valve (Also spring return and rotary types)

Standard hand control valve (Single or duplex)

HANNIFIN

Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

Your best work
Your fastest work

WITH THESE

ACCURATE TAPS

Today's State of Emergency calls for a doubling of efforts to conserve. An important step in this direction is the use of REIFF & NESTOR Taps. Your best work, and fastest work, is accomplished by their application, as industry has discovered through the use of REIFF & NESTOR Taps for the past forty years.

Your machine set-ups will run longer because of the quality heat treating and accurately controlled grinding that puts L-I-F-E into our products.

Remember, your best work results only if your Taps are perfectly accurate. REIFF & NESTOR Taps assure you of this.

REIFF & NESTOR COMPANY
Tap Making Authorities
LYKENS • PENNSYLVANIA

BOSTON UNIVERSAL ANGLE PLATE

A Precision Tool that Holds Work at Any Desired Angle.

Puts Speed and Profit into Angular Drilling, Milling, Planing, Shaping, Grinding

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

Made in several stock sizes.

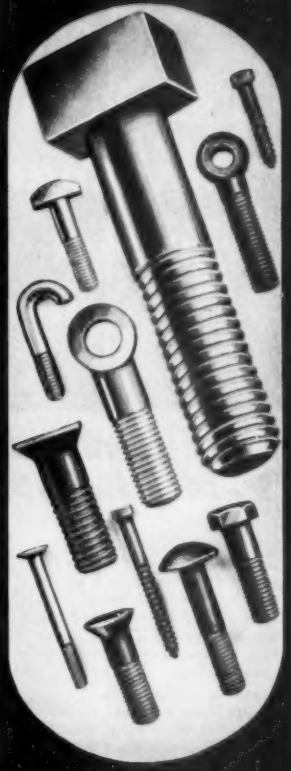
Write today for full information.

US AUTOMATIC BOX MACHINERY CO., Inc.
40 ARBORETUM ROAD • BOSTON 31, MASSACHUSETTS

THREADED SPECIALTIES

TEE BOLTS

by an exclusive method



Among Pawtucket's many specialty products, these lower-cost tee-head bolts are the leaders in this field. Pawtucket's exclusive production method keeps cost low, dimensional accuracy unusually high and strength above standard.

Pawtucket tee-head bolts are made in standard sizes ¼" and larger, or to your specifications. In any size, you can depend on a uniform Class 3 fit, if required.

BETTER BOLTS SINCE 1882

PAWTUCKET
MANUFACTURING COMPANY
327 Pine Street Pawtucket, R. I.
THE PLACE TO SOLVE YOUR BOLT PROBLEMS

Photo—Courtesy East Dayton Tool & Die Co.

IN DAYTON, OHIO, TOOL SHOPS

More Minster Try-out Presses Than All Other Makes Combined

Dayton, Ohio, one of America's greatest tool making centers, expresses an overwhelming preference for Minster presses. In all Dayton shops, large and small, 36 out of 62 presses used for try-out work are Minsters.

Remember this preference for Minster presses the next time you need press equipment. Minster offers excellence of design, performance at its finest, service of unusual dependability.

THE MINSTER MACHINE COMPANY, MINSTER, OHIO

MINSTER
FIRST IN *Press* DESIGN

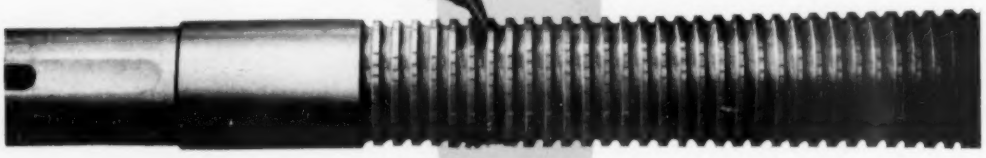
SAVE WEEKS OF VALUABLE TIME!
It's easy to SHARPEN all types and sizes of BROACHES with this

VERSATILE LAPOINTE

UNIVERSAL BROACH SHARPENER

Built with simplified "Touch-Controls", it practically eliminates all need for skill in sharpening broaches. Any reasonably good tool man can do an expert job in no time at all!

We design and build a complete line of standard and special broaching machines, tools and fixtures.



Available in 3 SIZES: 60", 72" and 80", the LAPOINTE Universal BROACH SHARPENER occupies a surprisingly small floor area and will soon pay for itself *in time saved and money earned.* Attachments are available for backing-off.

Ask us about the NEW 36" LAPOINTE Broach Sharpener designed especially for surface broaches. This sharpener has no head and tail stock, but uses a vise only. "Touch-Control" enables the operator to remove a minimum of stock, thus prolonging the life of the tool.

Every plant that owns a broaching machine needs the LAPOINTE Manual on Broach Sharpening.

Ask for Booklet BSM-2

50 YEARS IN BROACHING
We're the oldest in the world!
1902 • GOLDEN ANNIVERSARY • 1952

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

H-VW-M *Generators not only meet standards -they make 'em!*

Yes, today's performance standards are higher than ever for motor generator sets. And the final examinations that *all* H-VW-M low voltage motor generators must pass before delivery have consistently raised industry standards for voltage regulation, power factor correction, overload capacity, and exceptionally long and efficient life for all parts. It's a painstaking, exacting process, but the net result is a line of generators that can't be beat.

Manufacturing top-quality generators is only one of many results of over eighty years of constant electroplating development – a continuing policy summed up in H-VW-M Platemanship...your working guarantee of the best that industry has to offer–not only in plating–current generators–but in every phase of plating and polishing.

8541

For full information on all H-VW-M Low-Voltage Generators, ask for Bulletin G-102.

Your H-VW-M combination–of the most modern testing and development laboratory –of over 80 years experience in every phase of plating and polishing–of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING CO., MATAWAN, N. J.
PLANTS AT: MATAWAN, N. J. • ANDERSON, INDIANA
SALES OFFICES: ANDERSON • BOSTON • CHICAGO • CLEVELAND
DAYTON • DETROIT • GRAND RAPIDS • MATAWAN • MILWAUKEE
NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH
ROCHESTER • SPRINGFIELD (MASS.) • STRATFORD (CONN.) • UTICA

H-VW-M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

new era in welding!

A. C. WELDING MACHINES

Heavy-Duty CHAMPION

300-, 400- and 500-Amp. Production Welding Models. The extra years of service built into these machines make these models real welding champions.

The CHALLENGER

200-, 300- and 400-Amp. Production Welding Models featuring wide amperage range for adaptability to more jobs in any production welding shop.

The AUTO-MAN

650-Amp. Model. For Automatic or Manual Operation, singly or in multiple set-ups. Offers unusual flexibility for your welding requirements.

The UTILITY

An all-purpose Utility welder with 25 to 180 Amp. range for repair-shop, maintenance and farm use, and featuring production welder construction.

Made by Welders . . . for Welders

Production proved by one of the world's largest users of welding products

Now A. O. Smith advanced design... new plus features... give you the latest in welding machine efficiency

D. C. WELDING MACHINES

The D. C. RECTIFIER

200-, 300-, and 400-Amp. heavy-duty Production Welding Models for all d.c. jobs. The *one* rectifier-type welder designed to eliminate stack failure!

The FIELD KING Gasoline-Engine

200- and 300-Amp. Models. The most advanced of all engine-driven welding machines! Built for rugged jobs in the field. Welds with new speed and ease.

Redesigned to match *today's* welding requirements, *A. O. Smith advanced design welders* offer you the advantages of improved construction, top welding performance, and more operating benefits. A. O. Smith welders put you in the best position to cope with today's requirements and costs. Whether your welding is manual or automatic, A. C. or D. C., A. O. Smith welders assure you of having the finest power source available anywhere.

Ask your A. O. Smith representative, your A. O. Smith distributor or write us, for full details about these advanced design welding machines. *They merit your study.* A. O. Smith Corporation, P. O. Box 584, Milwaukee 1, Wisconsin.

A.O.Smith

WELDING PRODUCTS

good judgment calls for

PARKER-KALON®

when good design calls for

SOCKET SCREWS

SIZE-MARKED SOCKET HEAD CAP SCREWS

STRIPPER BOLTS

FLAT HEAD SOCKET CAP SCREWS

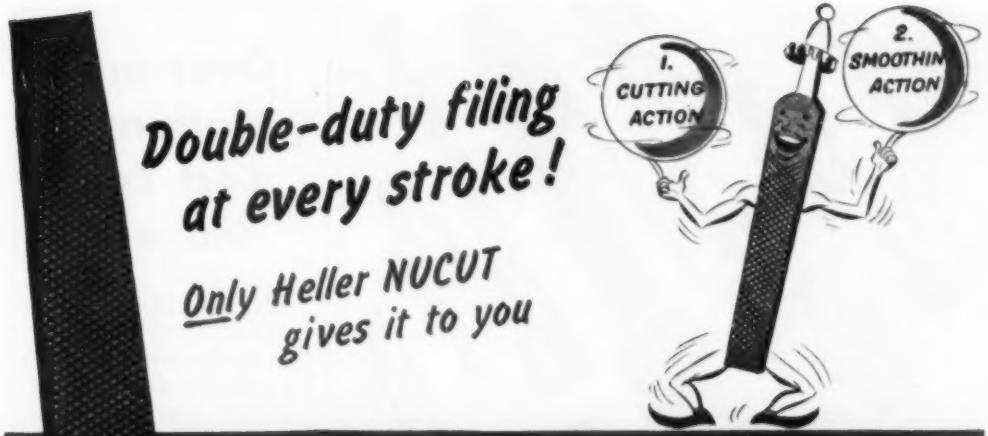
GROUND THREAD SOCKET SET SCREWS

ENGINEERED HEX KEYS

PIPE PLUGS

P-K SOCKET SCREW BULLETIN

16 pages, describes all types, lists sizes, and illustrates quality control back of P-K guarantee. Free on request from your local P-K Distributor. Ask for samples. See why P-K Socket Screws take top honors in any test. Parker-Kalon Corporation, 200 Varick St., New York 14.



Double-duty filing at every stroke!

Only Heller NUCUT gives it to you

HELLER NUCUT WAVY TEETH FILE

Reg. U.S. Pat. Off. Pat. No. 2027029

WITH A NUCUT YOU FILE MORE, FASTER, BETTER WITH LESS EFFORT

NUCUT files are *different*. You can *see* the difference. Just hold the file at an angle—and you'll spot the exclusive wavy pattern made by NUCUT's *two* sets of teeth. It's this patented wavy construction that gives you superior cutting power.

The teeth do two jobs at every stroke. The coarse teeth cut fast, clean, without skidding. The fine teeth leave the surface smooth. Just as if two files were working at every stroke.

See your distributor. He knows NUCUTS, and will help you in selecting the right sizes, shapes and cuts.

HELLER BROTHERS COMPANY
A New Jersey Corporation
America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO

Select right file for job. Files come in many different sizes, shapes, cuts and types. So, make sure you select the right file for the job.

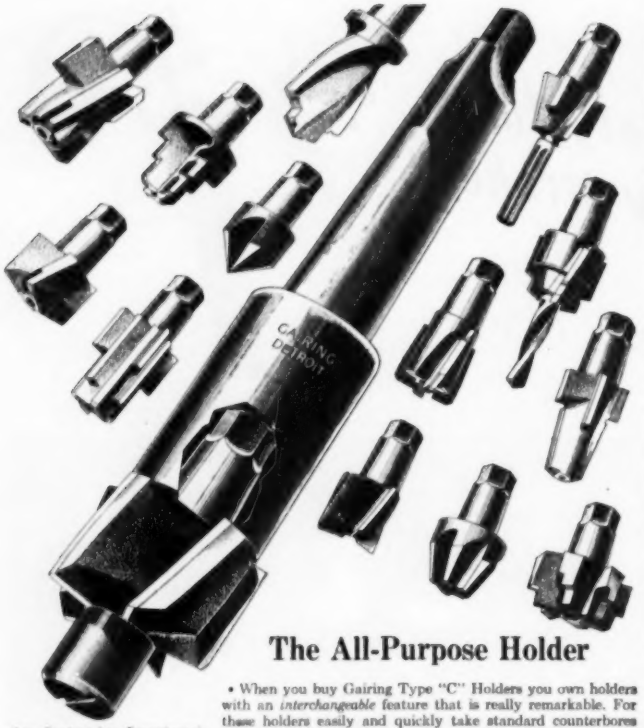
WRONG: Don't use a coarse file on fine work.

WRONG: Don't use a fine file on coarse, heavy work.

RIGHT: Fine work requires a fine file.

RIGHT: Coarse work should be handled with a coarse file.

CONTACT YOUR INDUSTRIAL DISTRIBUTOR for our FULL LINE of American Pattern, Swiss Pattern, Milled Curved-Tooth and Rotary Files, Rasps, Machinists' and Carpenters' Hammers, Blacksmiths' and Farriers' Tools, Bricklayers' and Plasterers' Trowels, Craftmaster Scrapers, Chisels, Punches, Masterenches and other quality tools.



The All-Purpose Holder

• When you buy Gairing Type "C" Holders you own holders with an *interchangeable* feature that is really remarkable. For these holders easily and quickly take standard counterbores and countersinks as well as *all types* of end cutting tools regardless of shape, contour or angles. They are adaptable for single or special purpose, or for a series of progressive operations.

• The taper and hexagon socket in this holder centralizes the cutter and serves as a driver co-acting with the taper and hexagon shank of the cutter. Thus, rigidity and perfect alignment are assured.

• The adaptability of these holders is *unlimited*, their intelligent use is production *economy*.

Our Engineering Department will gladly assist you with any tooling problem you may have. No obligation.

The Gairing Tool Company, Detroit 32, Michigan.

GAIRING TOOLS

STANDARD AND SPECIAL CUTTING TOOLS, BORING TOOLS, MILLING CUTTERS

Write for the Gairing Standard Tool Catalog and Price List, *showing Interchangeable Counterbores, Countersinks and Holders, Back Spotfacers, Core Drills, Block-Type Boring Tools, and the "E-Con-O-Mill" Standard Face Mills . . . or ask your local Gairing Representative.*

From the *American Machinist* Library of Tips for Top Shop Men

THE common belief that "perishable tools" are written off when they go out to the machine is one of today's most expensive notions. Unless control is exercised *in use* as well as in stocking, the machine, method or man that breaks or ruins an excessive number of tools is never spotted. In one test, ratio of tool use on two machines of the same type on the same job was 1 to 7.

Over-age Machines Cost You Money!

Over 42 per cent of metalworking production equipment was over 10 years of age in 1949 . . . 19 per cent was bought more than 20 years ago. These machines have had an average of a quarter century of use, including five years of wartime overwork and mistreatment.

How does *your* production machinery and equipment compare with your competitors', and with the Metalworking Industry's in general? The answers will be found in the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment.

Here are all the facts on the age and number of 155 major types of production equipment operating in 15 metalworking divisions and 25 major production areas. Cost is $2.00 per copy.

Write Reader Service Department:

American Machinist
McGraw-Hill Building
New York 36, N. Y.

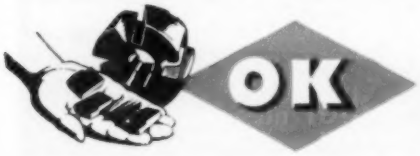
OK carbide cutters

make short work of taper-milling chrome-moly prop blades for B-36 Bombers at Curtiss-Wright Caldwell plant

Here is a good example of how progressive management speeds up heavy milling operations with carbide cutters. The machine is a high powered planer-type miller with mechanical feed and magnetic chuck. The cutter is a heavy duty OK 8600 dual adjustable carbide face mill. Work pieces are tough chrome-molybdenum steel 25" x 123" x .800" for C-W hollow propeller blades for famous B-36 Intercontinental Bombers. Each plate is taper milled for a distance of 107 inches, above and below center rib, the depth of cut increasing from zero to .390 inches. The lower half is milled on the forward stroke and the upper half is milled on the reverse stroke, at the rate of 23 inches per minute. A movie of this operation dramatically shows chips piling on the magnetic chuck and presto! . . . they drop when chuck is demagnetized.

OK carbide milling cutters are built for solid performances like this. They have the strength of simple construction – two-piece body and wedge-shape blades. Mating serrations insure blade security and provide for blade advancement to compensate for wear. No locks, wedges or screws weaken or mar the streamline design. With more beef in the body, OK cutters can better stand the terrific pressures of modern high speed milling.

If you have a milling problem, you should have OK catalog 13. An OK engineer will be glad to give the benefit of our experience over the past 50 years.

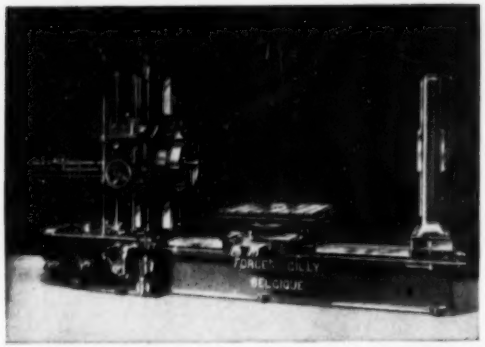


modern milling cutters for modern milling machines

THE OK TOOL COMPANY, Milford, New Hampshire

GILLY

HORIZONTAL BORING AND MILLING MACHINES

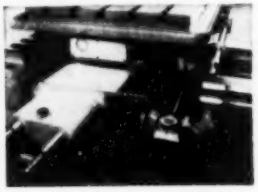


GILLY TABLE TYPE HORIZONTAL BORING AND MILLING MACHINE

VERSATILE—FAST RUGGED—DEPENDABLE

Gilly Horizontal Boring and Milling Machines are now in daily use in some of the country's leading metal working plants—one large manufacturer has installed a battery of 12, 3" and 4" machines.

These machines are finding favor because of the many design features, which are standard equipment:



1—Rotary table 90° positioning device, with dial gauge.

2—Table center setting device with dial gauge.

3—Trough and measuring rod fine adjustment device with dial gauge.

GILLY—TABLE AND FLOOR MODELS SPINDLE DIAMETERS FROM 2-9/16"—8"

IMMEDIATE DELIVERY

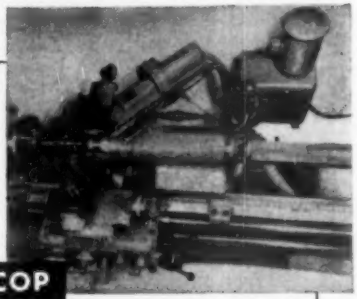
For Information and Specifications Consult Dept. A

STOKVIS ✿ EDERA & CO., INC.

93 MADISON AVENUE, NEW YORK 16, N. Y.

Telephone MUrray Hill 3-4935

REDUCE TURNING TIME UP TO 400%



Eliminate Rejects with the Amazing

BONDYCOP

HYDRAULIC COPYING ATTACHMENT

Adaptable to Cross Slide of any Lathe or Turret Lathe without disconnecting Cross Slide Feed Screw

- Machine pieces with 2 or 3 shoulders, 2" to 4" diameter — straight or tapered, *in fraction of usual time!*
- Easy setup permits short run economy.
- Produces first class machine finish.
- Reduces rejects as operator controls only one measurement.
- Simple to operate.

Write us today for complete details on this versatile attachment!

PROMPT DELIVERY • SALES TERRITORIES OPEN

MOREY *for machine tools!*

MOREY MACHINERY CO., INC.

Manufacturers • Merchants • Distributors

419 BROOME STREET • NEW YORK 13, N. Y.

CABLE ADDRESS: MOREYMAC, NEW YORK

ONLY THE NEW miller

SELENIUM RECTIFIER TYPE D.C. ARC WELDER

GIVES YOU THESE DISTINCTIVE FEATURES:

★ **MAGNETIC AMPLIFIER PRINCIPLE** which is an integral part built right into the MILLER SR welders . . . it is not a gadget . . . it is not an extra . . . it functions as a part of the welder itself.

★ **PULSATING D.C. CURRENT** which opens up entirely new fields in welding applications.

Select any one of the four MILLER SR welders . . . they are all tops in performance . . . they all have the same exclusive features which warrant your investigation now. Want to know more? Write for complete details — and the name of your nearest MILLER distributor.

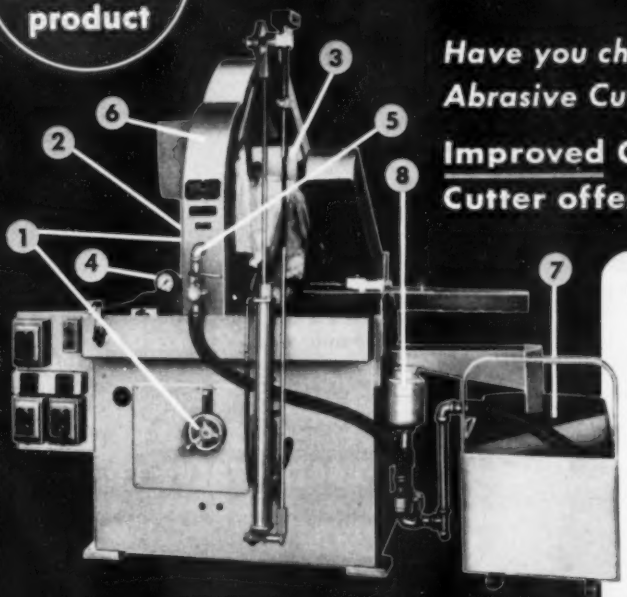
WRITE FOR NAME OF YOUR DISTRIBUTOR

miller ELECTRIC MANUFACTURING CO.

SINCE 1929 APPLETON WISCONSIN

an **ACCO** product

CAMPBELL ABRASIVE CUTTERS



Have you checked on Abrasive Cutting lately?

Improved Campbell No. 406 Cutter offers these features:

1. **BRIDGE TYPE WORK CLAMP** on both sides of cutting wheel, quickly and easily adjusted
2. **WHEEL GUIDES** for more accurate cuts . . . reduces wheel flutter
3. **CUTTING WHEEL OSCILLATION** for quality cutting over 2" diameter solids
4. **LOW PRESSURE SELF-CONTAINED HYDRAULIC SYSTEM** for operating controls
5. **EASILY ADJUSTED, SIMPLIFIED, RUGGED COOLANT DISTRIBUTOR** to insure adequate supply of coolant on both sides of cutting wheel
6. **COMPLETELY ENCLOSED CUTTING WHEEL** for operator's safety
7. **SEPARATE COOLANT TANK** . . . large capacity . . . may be easily removed for cleaning
8. **EXTRA-LARGE CAPACITY COOLANT PUMP**

—plus many other valuable features!

CAMPBELLS *Save You Money*

• Even old model abrasive cutters made big savings by reducing the cut-off time per piece, but the new improved CAMPBELL Abrasive Cutters—with their many new time and effort reducing features—show still greater efficiency and savings. CAMPBELLS pay for themselves out of savings.

Check the methods and equipment you use. On many jobs cutting time can be reduced up to 75%. Machines can be furnished in fully automatic or semi-automatic types.

Write today for Bulletin **DH-260** which tells you how to modernize your cutting procedure with a CAMPBELL 406. Then give us details of the job to be done so we can make recommendations and quote prices.

ACCO

TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE

923 Connecticut Ave., Bridgeport 2, Conn.

CAMPBELL
Abrasive Cutters and Nibblers

"— and they chopped down the Old Pine Tree."

Woodsmen Use Marking Devices!

When a forester indicates a tree is to be cut by the lumberjack he usually paints a mark just above the ground and another about breast-high, indicating it is to be cut for lumber purposes. If the tree is diseased he usually marks it with an X or other suitable device, indicating that it is to be cut for destruction or firewood.

CADILLAC MARKING DEVICES

are Designed for ALL MARKING PURPOSES

Whatever your requirements, from small Hand Stamps to Pneumatic, Hydraulic or especially created Marking Machinery, CADILLAC STAMP COMPANY stands ready to supply or design and build to meet your needs.

INTERCHANGEABLE TYPE and TYPE HOLDER SETS

The faces of CADILLAC Steel Letters and Figures combine a high degree of hardness with toughness, insuring especially long life. All CADILLAC Marking Type and the recess in Type Holders are made in standardized dimensions. This means that type will fit interchangeably in hand holders, marking machine holders or punch press holders designed for the size type specified. Due to the precision adhered to in manufacturing, they will when assembled in any holder make impressions in perfect alignment.

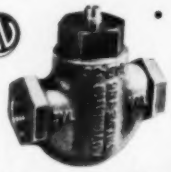
HEAVY BEVEL HAND STAMPS
CADILLAC Heavy Beval Letters and Figures combine a high degree of hardness with toughness, insuring exceptionally long life.

HAND STAMP SYMBOLS
A system of distinctive symbols for inspection and confidential markings. Write for Symbol Chart.

CADILLAC STAMP CO.
17311 RYAN ROAD • DETROIT 12, MICH.
3000 IRVING PARK • CHICAGO 18, ILLINOIS

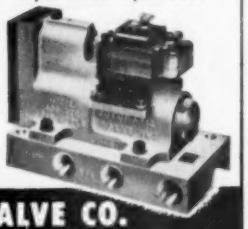
Solenoid VALVES

PILOT VALVES
3-WAY 4-WAY
For operating Master Valves and Small Cylinders



***Speed Control* VALVE**
Controls speed of Air and Hydraulic Cylinders

***3-Way and 4-Way* VALVES**
Pilot Operated
Sizes ¼" — ⅜" ½" and ¾"
Write for Bulletin



AUTOMATIC VALVE CO.
37427 GRAND RIVER AVE., FARMINGTON, MICH.

SCHERR MAGNI-RAY The Illuminated MAGNIFIER for PRECISION INSPECTION

Oblique rays make scratches and defects stand out clearly
Genuine optical glass lenses.
Heavy adjustable base.
Removable lens housing for inspection of large surfaces, engines, etc. . .

WRITE FOR ILLUSTRATED FOLDER
GEORGE SCHERR CO., Inc. • 200D LAFAYETTE ST. • N. Y. 12, N. Y.

ROLL-FORMING MACHINES & ROLLER DIES
Engineering Service on Your Metal Forming Problems
J & L MACHINERY & SUPPLY CO.
7906 MACK AVE., DETROIT 14, MICH. WA 5-0800

LELAND-GIFFORD
the BIG NAME in Drilling Machines
★ ★ ★
LELAND-GIFFORD COMPANY
Worcester, Massachusetts • U.S.A.

SAVE TIME
Contact the office nearest you
CHICAGO 6
565 W. Washington Blvd.
DETROIT 26
1533 Dime Bank Bldg.
CLEVELAND 1
P. O. Box 5547
NEW YORK OFFICE
75 South Orange Ave.
South Orange, N. J.
LOS ANGELES OFFICE
2620 Leonis Blvd.
Vernon 58, Cal.
ROCHESTER 18
P. O. Box 67
Rosslawn Station

Super

STANDARD CARBIDE

END MILLS

FROM Stock

Seven styles of end mills — straight and taper shanks — complete range of sizes.

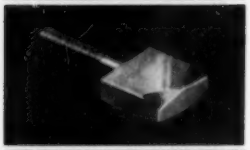
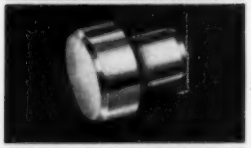
Also specials to your prints

STC

SUPER TOOL COMPANY

21650 Hoover Road
Detroit 13, Mich.

5210 San Fernando Rd.
Glendale 3, Calif.

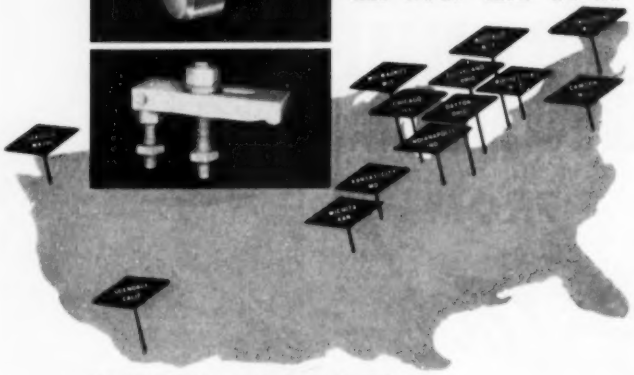



WESPO

Standard Clamps and Components

AVAILABLE IN STOCK

all over the U. S.



STOCKS AT FACTORY AND FOLLOWING:

T. R. Goldsmith & Son, 33 Clyde Ave.—BUFFALO 15, N. Y.
Fidelity Tool Supply, 309 Vine St.—CAMDEN 2, N. J.
J. R. Reinertson & Co., 24 S. Crawford Ave.—CHICAGO 24, ILL.
T. E. Wardrope Agency, 10014 Euclid Ave.—CLEVELAND 6, OHIO
H. D. Geisler Co., 2715 Salem Ave.—DAYTON 6, OHIO
Mfgrs. Service Supply, 242 Taunton Ave.—E. PROVIDENCE, R. I.
Art Lewis Product Equipment Co., 422 Magnolia Ave.—GLENDALE 4, CALIF.
Standard Die Supply, 26 E. McCarty St.—INDIANAPOLIS 25, IND.
Ernst Machine, 1606 Oak St.—KANSAS CITY 8, MO.
Bell-Well Sales Co., 1323 N. Water St.—MILWAUKEE 2, WIS.
Rekers & Roessel, 1119 Ridge Road East—ROCHESTER 21, N. Y.
H. F. Sodering Co., 1745 4th Ave. South—SEATTLE 4, WASH.
Cummings & Co., 115 E. Lewis St.—WICHITA 2, KAN.

WEST POINT MFG. CO.
26935 W. 7 Mile Road, Detroit 19, Mich.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

9025 VAN WYCK AVENUE
JAMAICA, NEW YORK

TELEPHONE: JAMAICA 6-4090

What do *you* want to know more about?

Plastics? Forging? Milling? Employee training? Materials handling? Presswork? Depreciation? Testing and Inspection?

Whatever the subject . . . if it is concerned with the production of better metalworking products at lower costs . . . you will probably find many sensible, helpful answers and suggestions in one or more of *American Machinist's* Special Editorial Reports. There is one in every issue of this magazine, and over 60 of our previous Special Reports are available now in reprint form.

Send for a list of reports currently available. Write to our Reader's Service Department at the address below.

American Machinist

McGraw-Hill Building
New York 36

KENT-OWENS BUILDS 'EM

RUGGED

TO KEEP YOUR PRODUCTION UP AND COSTS DOWN!

Maybe we're "sticking our neck out"—but we think your toughest milling problems can be handled *right* with Kent-Owens Machines!

On countless jobs—these Milling Machines have shown ability to turn out the work with top speed and high accuracy. They're outstandingly rugged . . . efficient . . . dependable. Designed with practical features that help you *produce more* . . . with *lower costs!* The Kent-Owens Standard line includes a wide range of hydraulic and hand operated machines. Let Kent-Owens engineers recommend machines and tooling best suited to your requirements. Write us about your needs. Kent-Owens Machine Company, Toledo, Ohio.

KENT-OWENS

Milling Machines

KENT-OWENS REPRESENTATIVES

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Four States Mach'y Company

DALLAS
Hunter Machine Tool Co.

DAYTON
Granger Mach'y Company

DETROIT
A. C. Hollenbeck Mach'y Co.

FT. WAYNE
Cisco Machinery Co.

GRAND RAPIDS
Joseph Monahan

HAMILTON, ONT.
F. F. Barber Mach'y Company

HARTFORD
Harrington Machinery, Inc.

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Cisco Machinery Co.

KANSAS CITY
Richman Machinery Co.

LOS ANGELES
Boyles & Gompers Mach'y Co.

MILWAUKEE
Four States Mach'y Company

MINNEAPOLIS
The Lamoreux Company

MOLINE
John J. Nissimoglo Co.

MONTREAL
F. F. Barber Mach'y Co.

NEW ORLEANS
Oliver H. Van Horn Co., Inc.

NEW YORK
Harrington-Wilson-Brown Company

PHILADELPHIA
Cahoe Machinery Company

PITTSBURGH
Barnes Machinery Company

ROCHESTER
F. W. Schieber Machinery Co.

SAN FRANCISCO
C. F. Bulmer Machinery Co.

ST. LOUIS
Blackman & Pharmer Mach'y Co.
Clarke Equipment Company

SYRACUSE
J. F. Owens Mach'y Company

TORONTO, ONT.
F. F. Barber Mach'y Company

WALKERVILLE, ONT.
F. F. Barber Mach'y Company

When job specifications leave no leeway, when extreme tolerances must be rigidly maintained... that's when the built-in precision of Grand Rapids Grinders proves most valuable.
Defense commitments are delaying rapid fulfillment of your orders . . . but as always we're doing our best to serve you.

GALLMEYER & LIVINGSTON CO.
330 Straight Ave. • Grand Rapids, Mich.

GALLMEYER & LIVINGSTON

GRAND RAPIDS GRINDERS
...the very best

Manufacturers of Surface Grinders • Cutter and Tool Grinders • Tap and Drill Grinders

THERE'S NO SUBSTITUTE FOR THE MAN WITH HOLES IN HIS HEAD
.. or the Madison tools he designs

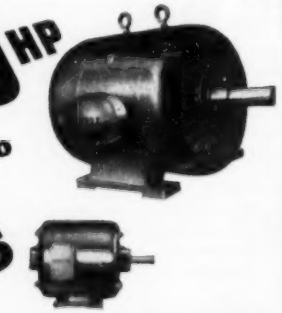
Using other than a Madison Boring Tool for suitable Madison tool applications is like putting a square peg in a round hole. That's because every Madison-engineered tool is built to do your particular boring job faster at lower cost . . . no matter whether you use a standard Madison cutter in a standard Madison bar, or specially designed Madison bars and Madison cutters . . . engineered by the *"Men With Holes in Their Heads."* To get the benefit of thirty-five years specialized experience in boring operations exclusively . . . thirty-five years of concentration on lowering boring costs and increasing production, write Madison today. Naturally there's no obligation.

Write for informative Madison Borereaming Catalog

BETTER BORING TOOLS . . . MORE BORING EXPERIENCE

MADISON MANUFACTURING COMPANY
Dept. AM Muskegon, Michigan

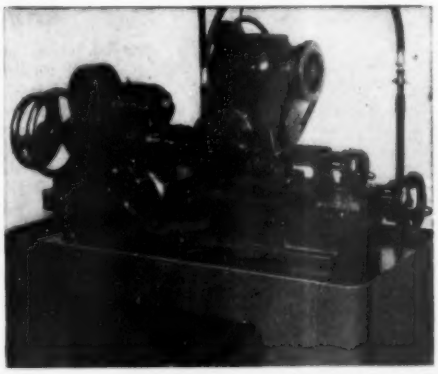
250 HP
Down to
1/6



we've got them all!

You can choose from a complete line of alternating current industrial-type motors —standard or special—single or polyphase— for every job. Get fast delivery, no red tape. Call your local Howell representative or contact us direct.

HOWELL ELECTRIC MOTORS CO.
HOWELL, MICHIGAN



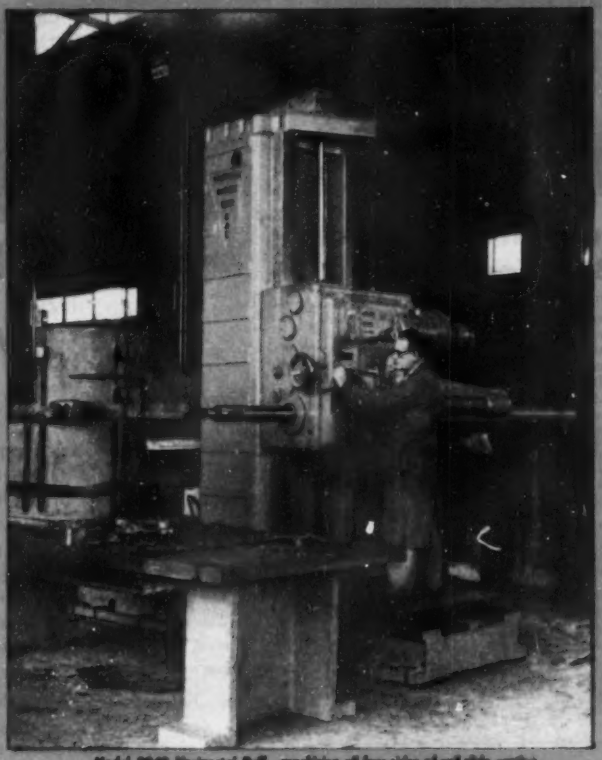
WALTHAM THREAD MILLING MACHINES
. . . for producing accurate, fine-finish threads on small diameters at low cost

This NEW model is mounted on a welded steel base in which are accessibly located control panel, coolant motor and pump. It is equipped with separate motors for cutter, work and coolant. Motor push buttons are conveniently placed.

Swing over carriage is 3" and work 2" diameter or smaller can be handled. Threads 8¾" long can be cut with work held on centers. Special attachments are available for extending the utility of this machine. *Illustrated literature available on request.*

WALTHAM MACHINE WORKS
HIGH STREET WALTHAM, MASS.

Kaukauna UNIVERSAL AND HORIZONTAL DRILLING AND TAPPING Machines



Model 3040 Horizontal Drill—machining all four sides of rail slide casting.

CUT COSTS ON SETUP TIME, CRANE TIME, FIXTURING MACHINE HOURS

. . . drive boring fixtures and perform drilling, reaming, boring, counterboring, tapping and spotfacing operations on any size or shape from small production parts to large unwieldy workpieces.

Model 3040 is a sturdy rugged horizontal drilling machine with 10 HP, 15HP or 20HP spindle motor and unusual column rigidity. Maximum productivity assured by use of highest feeds and speeds permissible with modern cutting tools.

Other horizontal models have tilting head or horizontal head and 360° column swivel. Universal models with compound head swivel permit angular, radial and horizontal machining operations with one setup. Machines designed for both portable and stationary applications. Extended runway travel and column height available on all models. Special adaptations to handle your machining problems.

WRITE FOR CATALOG

Model 125-U Universal Drill—drilling, tapping and doweling rocks in place on boring machine runway.

Model 125-HR Horizontal Drill—used with revolving table to drill and tap tractor frames.

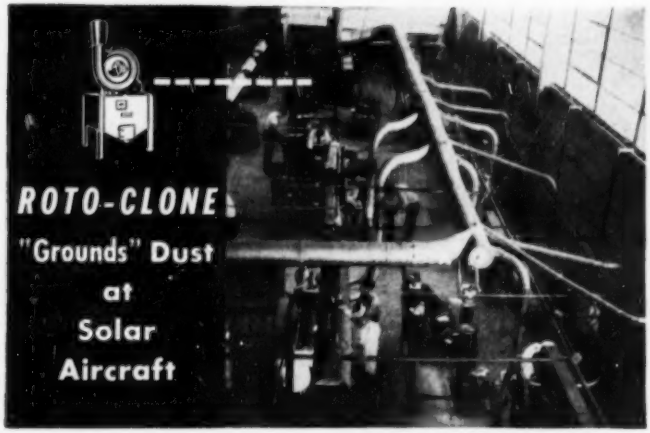
Model 1020 Horizontal Drill—performing drilling, tapping and boring operations on milling machine column.

Special Model 140-U with extended column, runway, and reach—for drilling Diesel Engine bases and blocks.

KMC

Kaukauna MACHINE CORPORATION

KAUKAUNA WISCONSIN U S A



Compact Type D Central System Services 14 Dust Sources in Busy Tool Room

Good housekeeping encourages good workmanship. That's why Solar Aircraft, San Diego, Calif., producer of vital aircraft parts, has applied AAF Roto-Clone* Dust Control throughout its tool room.

Fourteen dust sources, including bench, cutter, drill and surface grinders, are serviced by a single Type D Roto-Clone—the dynamic precipitator which combines the functions of exhausting, separating and storing dust in a single unit. Note how its compact design permits location near dust sources—holding piping to a minimum and concentrating dust storage at one convenient disposal point.

The Type D Roto-Clone can be adapted to any metal grinding or finishing operation.

When dust sources are grouped (as above), it can operate as a central system. For the isolated job, there's a Type D of a size and capacity to serve the individual operation. In all cases, the Type D's high collection efficiency, low operating cost and compact design result in an efficient, economical installation.

Why not have an AAF representative make a "dust check" of your metal working operations? If you have a problem, he has the solution. Call him today or write us direct.

**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

American Air Filter
COMPANY, INC.

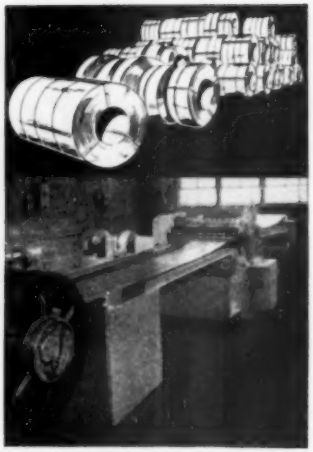
AAF

207 Central Avenue, Louisville 8, Ky. • American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

HOW TO REDUCE THE COST OF THIN METAL STAMPINGS

is a problem to which many good answers are available. You'll find some excellent ones in *American Machinist's* special report by that title . . . and 15 cents will bring you your copy.

Write to:
Reader Service Department, *American Machinist*
330 W. 42nd Street, New York 36, N. Y.



Better Control of STRIP SUPPLY

If you use over 100 tons of strip per month, in special widths, a Yoder Slitter will bring welcome relief from strip supply difficulties.

Mill-width strip is more easily obtained from numerous sources, and at lower cost. A saving of ten to twenty dollars per ton is quite common, soon paying for the slitter investment.

With a flexible stock of mill-widths of the desired gauges, you no longer need to anticipate requirements for special widths far in advance. Your production planning becomes much easier and the need for big inventories of slit strands disappear when you can supply your own needs on a few hours' notice.

Send for literature on the economics and mechanics of slitter operation. Consultations, estimates and recommendations for the asking.

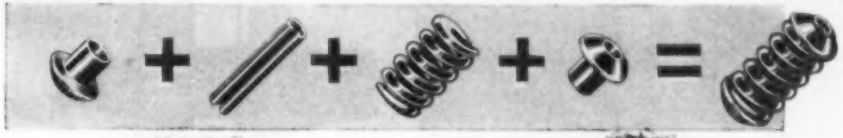
THE YODER COMPANY
5519 Walworth Ave. • Cleveland 2, Ohio

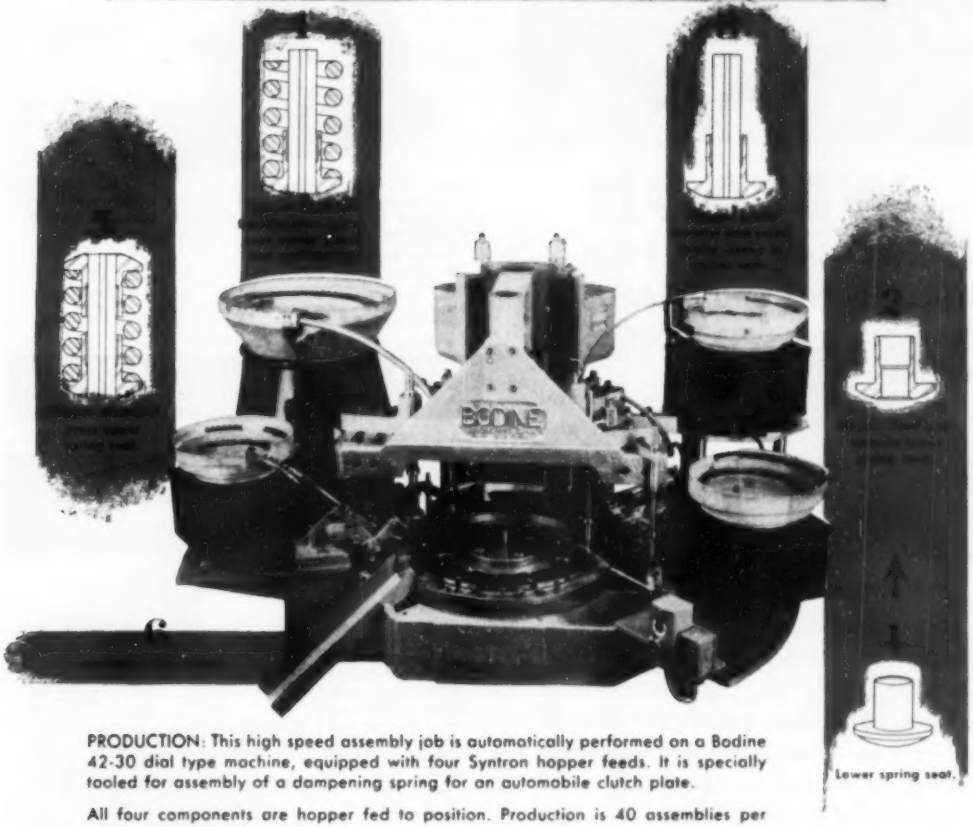
Rotary Gang SLITTERS

YODER

Bodine CASE HISTORY NO. 33

Bodine ASSEMBLES A DAMPENING SPRING AUTOMATICALLY





PRODUCTION: This high speed assembly job is automatically performed on a Bodine 42-30 dial type machine, equipped with four Syntron hopper feeds. It is specially tooled for assembly of a dampening spring for an automobile clutch plate.

All four components are hopper fed to position. Production is 40 assemblies per minute . . . automatically ejected.

Bodine engineers can solve your problems for repetitive production of small parts . . . milling, drilling, tapping or assembly, automatically . . . at low cost. Write us!

You Can't Meet Tomorrow's Competition

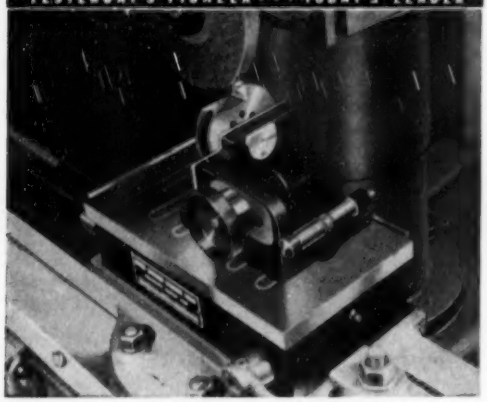
With Yesterday's Machine Tools

THE **Bodine** CORPORATION

BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING AND SCREW INSERTING MACHINES

YESTERDAY'S PIONEER - - - TODAY'S LEADER



WELDON

CIRCULAR FORM TOOL SHARPENING and MEASURING FIXTURE...

To reduce tool and production costs give circular form tools the treatment they deserve by the use of the Weldon Circular Form Tool Sharpening and Measuring Fixture.

It's a convenient and accurate aid in sharpening and measuring of all sizes of high speed steel or carbide tipped circular form tools. Insures maintaining the original shape of form tool by keeping proper relationship of cutting face to center line of tools.

The micrometer measures the correct distance the cutting face should be below center line of tool. The fixture may be used on any surface grinding machine.

Write for descriptive folder No. CGM 1-49

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

Presently in use by leading manufacturers!

DIMCO

HEAVY DUTY RADIAL DRILLING MACHINES

★ *IMMEDIATE DELIVERY!* ★ *NO PRIORITIES REQUIRED!* ★

No. TR-1N 4 ft.
No. TR-2N 5 ft.

Rigidly built and carefully constructed for top performance and production economy, these radial drilling machines feature hardened and ground gears of high tensile alloy steel, accurately balanced and precision cut.

PARTIAL SPECIFICATIONS	TR-1N	TR-2N
Drilling cap. in cast iron	2⅛"	2⅛"
Drilling cap. in steel	2"	2"
Max. drilling radius	45⅛"	65⅛"
Vert. travel of spindle	13¾"	13¾"
Spindle speeds (16)	40-1500 rpm	40-1500 rpm

• *Write us for complete information!*

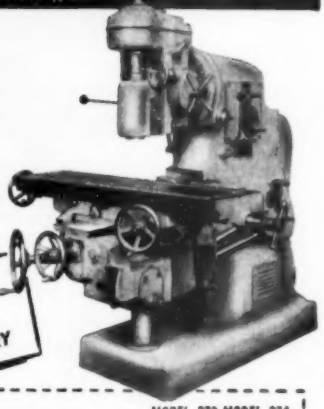
KELVIN SYSTEMS CORPORATION
RADIAL DRILLS • MILLERS
TURRET LATHES • GRINDERS
SHAPERS • COPYING LATHES

NEW HURÉ *PRECISION*

VERTICAL MILLING MACHINE

Also available in Universal type

Built in France to accurate American specifications and measurements, this sturdy machine incorporates all the latest developments in machine tool design . . . with special features that years of experience have proved highly desirable in milling machines of this type.



NO PRIORITIES STOCK DELIVERY

PARTIAL SPECIFICATIONS		MODEL 273	MODEL 274
	Long. feed range	32"	37-25/64"
	Cross feed range	14⅞"	16-9/64"
	20 speeds range RPM	20 to 1600	20 to 1600
	Motor	6	7

• Write today for illustrated folder giving full details.

MOREY *for machine tools!*

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
419 BROOME ST. • NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-7400
CABLE ADDRESS: WOODWORK, N. Y.

MUELLER BRASS CO.

"600" SERIES

a better bearing bronze containing no-hard-to-get tin

If you use gears, connecting rods or other parts requiring bearing properties, it will pay you to investigate "600" Series, a high strength bronze that *contains no tin*. "600" Series outperforms phosphor bronzes and other bearing metals . . . it will also save time, money, and material. "600" Series bearing metals can be forged into relatively complicated shapes and produce a forging of close-grained homogeneous structure impossible to get in a sand casting. The forged shape is closer to finished size than a casting, often requires less machining, and eliminates the need of a bushing. "600" Series is available in standard and special extruded shapes in 12' mill lengths. These alloys have a low coefficient of friction, a tensile strength 2½ times greater than cast phosphor bronzes and high resistance to corrosion. There is a "600" Series alloy with the properties to fit your bearing metal need . . . write today for further facts.

Typical forged parts and ROD shapes produced from Mueller Brass Co. "600" Series bearing bronze

MUELLER BRASS CO.

PORT HURON 18, MICHIGAN

There's a Walker Magnetic Chuck for Every Known Application . . .

RELIABILITY — STRENGTH

The Walker "Concentric Gap" Magnetic Chuck meets day-in, day-out requirements for a powerful holding device. For more than forty years, with a basic electro-magnetic circuit, the Walker "Concentric Gap" Chuck has proven itself reliable, efficient and economical.

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

IN CANADA—Upton Bradeen & James, Ltd.

From the *American Machinist* Library of Tips for Top Shop Men

"QUEER DUCKS"—the men that don't fit the pattern—are also the men who don't think like the rest. They'll give you trouble, but they'll usually also give you ideas. Barnyard ducks conform readily to rules, but end up in a pot.

WATCH always for the jobs you can't do—well. Specialized equipment and specialized knowledge outside may be worth the extra cost in reduced scrap and headaches. Sometimes the price may be less too—and it costs nothing to get an estimate.

How to choose and use

Automatic Lathes

• Versatile, as well as fast, the automatic lathe is capable of performing a large number of operations . . . turning, facing, chamfering, boring, and contouring.

How to Choose and Use AUTOMATIC LATHES

16 pages—25 cents

This *American Machinist* Special Report, tells you how to obtain greater output and lower costs in the operation of your single-spindle units.

• Abundant with instructive photographs and drawings, copies of this report are available at 25 cents each.

• Similar Special Reports on the following topics are also available.

MULTI-SPINDLE BAR MACHINES

16 pages—25 cents each

●

AUTOMATIC TURRET LATHES FOR CHUCKING WORK

16 pages—25 cents

READER SERVICE DEPARTMENT
American Machinist
McGraw-Hill Building
New York 36, N. Y.

HARDENED AND PRECISION GROUND PARTS

ALLIED WITH AIRPOWER

At Allied's Plant 3 in Hillsdale, Michigan, aircraft engine parts such as those illustrated are being produced in high volume. It is significant that Allied is a preferred source for such parts . . . past experience having proved that here the most exacting specifications for close tolerances, fine surface finish and carefully controlled heat treatment will be met *exactly*.

Within the past few months, a spacious factory addition has been completed and considerable new equipment has been installed at Plant 3. With production now increased by approximately 40%, Allied is in a greatly improved position to meet your present and future needs for hardened and precision ground parts of many types. We'll be glad to receive your part prints for quotation.

other ALLIED PRODUCTS

SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS • SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • ALLITE (ZINC ALLOY) DIES • JIGS • FIXTURES
R-B INTERCHANGEABLE PUNCHES AND DIES

PRECISION · EXPERIENCE · DEPENDABILITY
ALLIED PRODUCTS CORPORATION

ALLIED PRODUCTS CORPORATION

DEPT. D-9 • 12605 BURT ROAD • DETROIT 23, MICH.

PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.

PLANT 4
Hillsdale, Mich.

an ACCO product

Sphero-Conical
DIAMOND BRALE PENETRATOR
for Hardened Steel

HOW IT WORKS

A. Minor Load Penetration
B. Major Load Penetration
C. Linear measurement of penetration increase which "ROCKWELL" converts to hardness reading

BRALE Penetrator Accuracy Is Proved in Wilson's Standardizing Laboratory

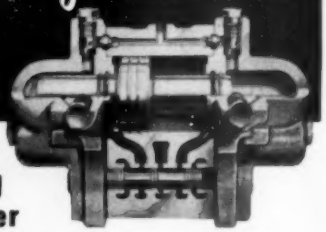
One point of hardness on the Rockwell C scale equals .00008", so penetrator accuracy must be constant. That's why Wilson maintains its Standardizing Laboratory for testing and approving every BRALE penetrator.

Each BRALE is precision ground to shape under high magnification to research laboratory accuracy. Wilson's BRALE Penetrator gives true readings at all dial points. For accuracy use a diamond BRALE penetrator on your hardness tester. Write for literature.

WILSON "ROCKWELL" and TUKON Hardness Testers

ACCO "Trade Mark Registered"
WILSON MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE
230 B Park Avenue, New York 17, N. Y.

Multiply Pressure without increasing horsepower



On most presses and in many other applications, pressure requirements change during the operating cycle. The Racine "Variable Volume" low pressure pump with a Racine Pressure Booster can be used to develop and hold up to 5000 psi. The horsepower input does not exceed the power needed to operate the pump at its low pressure setting.

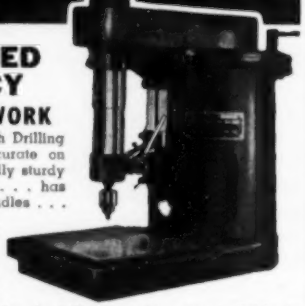
This means lower first cost, less horsepower consumption, reduced cylinder sizes — a more compact over-all design. Pressure and volume delivered can be controlled by one of the built-in governors that are standard for all RACINE pumps.

BUY DEFENSE BONDS

RACINE

RACINE HYDRAULICS & MACHINERY, INC.
2051 Albert St., RACINE, WISCONSIN, U.S.A.
Write for New 3-color Catalog P-10-E.

SIGOURNEY M-100



MAINTAINED ACCURACY IN PRECISION WORK

The Sigourney M-100 Bench Drilling Machine is extremely accurate on precision jobs. It is unusually sturdy and rigid in construction . . . has hardened and ground spindles . . . and sealed ball bearings throughout. All moving parts are entirely closed for maximum operator safety. M-100 is built for long and steady service. This sturdily constructed bench drilling machine is available in 1, 2, 3 and 4 spindle models . . . speeds from 4,000 to 10,000 r.p.m.

Send for illustrated bulletin

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

Sole Sales Agents
PRATT & WHITNEY
Division Niles-Bement-Pond Co. West Hartford, Connecticut

IS YOUR LARGE SURFACE GRINDER a Diamond Eater?

IF IT IS . . .
the Precision Diamond Tool #128 or #129 is the answer to your problem.

Seven elongated diamonds set in the P.S.M Matrix which adheres to the diamond under all conditions. Economically substitutes for larger expensive diamonds. Stays sharp longer than large diamonds, large flat areas do not develop. 9/10 of the diamonds can be used. A consistently efficient tool.

#128 Seven stone multiple tool—
7/16"x 1½" shank $27.55 postpaid

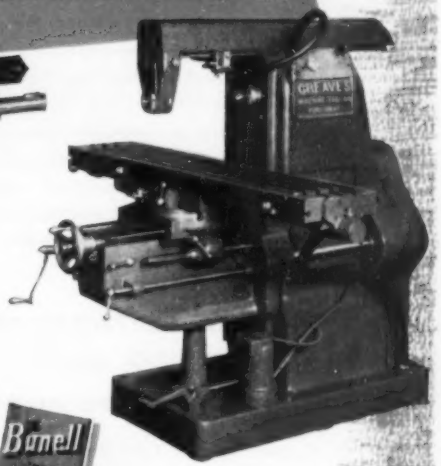
#129 Seven stone multiple tool—
½"x 1½" shank $27.55 postpaid
ORDER TODAY!
Immediate delivery—shipped from stock

PSM MATRIX

PRECISION DIAMOND TOOL CO.
102 S. Grove St., ELGIN ILLINOIS

GREAVES MACHINE TOOL CO.

Cuts Boring Time on Columns 75% with BUNELL TOOLING



● The Greaves Machine Tool Company of Cincinnati, Ohio, a leading manufacturer of Milling Machines, has reduced the time required for boring their machine columns by 75% with Bunell Tooling.

● Greaves is also consistently obtaining a greater degree of precision and accuracy by the use of Bunell Boring Fixtures and Boring Bars (illustrated above). Time and labor savings like this speed production and help Greaves reduce costs and meet shorter delivery requirements of customers.

● Bunell's complete modern plant facilities and experienced engineering staff are available to help you with your tooling problems. Write for full information.

WRITE FOR FREE CATALOG which describes Bunell services, facilities and equipment.

THE BUNELL MACHINE & TOOL CO. CLEVELAND O. BUNELL

BUNELL MACHINE AND TOOL CO.

1600 EAST 24th STREET • CLEVELAND 14, OHIO

Since 1920, Designers and Builders of Special Tools, Dies, Jigs, Fixtures and Special Machines

Yes, We Can Do It!

We Can Quote on Your Application, Accept Your Order and DELIVER

We are in an enviable position whereby we can deliver the answer to your assembly problem in the form of a particular piece of equipment designed especially for your needs . . . We can do it NOW—not maybe—some time in the future. Though generally speaking, deliveries throughout industry are uncertain, and this situation probably may continue for some time, our position is different . . . We have marshalled our resources and facilities in a way whereby we can positively assure the execution and delivery of your orders without delay.

DETROIT POWER SCREWDRIVERS, HOPPER FEEDING UNITS

NUT DRIVERS, SPECIAL ASSEMBLING MACHINES

Thousands of manufacturers have profited through greatly stepped-up production as a result of our service. You, too, can benefit by the use of D. P. S. power-driven machines. Get further details. Also send sample assembly for production estimate.

DETROIT POWER SCREWDRIVER CO.

2797 W. FORT ST. DETROIT 16, MICH.

HASTELLOY Alloy D Valves FOR HOT SULPHURIC ACID

HASTELLOY alloy D valve castings can be obtained with an ultimate strength of from 110,000 to 125,000 psi and hardness as high as Rockwell C-48. These castings have excellent resistance to sulphuric acid, in addition to their high strength.

Some Penetration Tests for HASTELLOY Alloy D in Sulphuric Acid *

Conc., per cent by weight	20 deg. C.	70 deg. C.	Boiling Point
10	0.00019	0.0015*	0.0011
25	0.00011	0.0011	0.00074
60	0.0000074	0.00026*	0.0074
85	0.00019	0.0039	0.025
95	0.000064*	0.0007*	0.035

* inches per month * aerated test

For information on HASTELLOY alloy D castings, and for the name of a manufacturer who can supply you with high-quality valves, write to our General Offices.

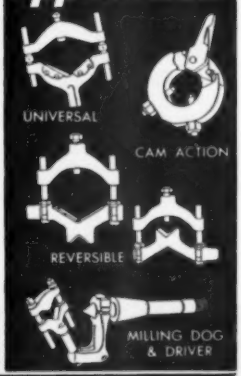
Haynes Stellite Company
A Division of Union Carbide and Carbon Corporation
UCC
General Offices and Plant: Kokomo, Indiana

"Hastelloy" is a trade-mark of Union Carbide and Carbon Corporation

---

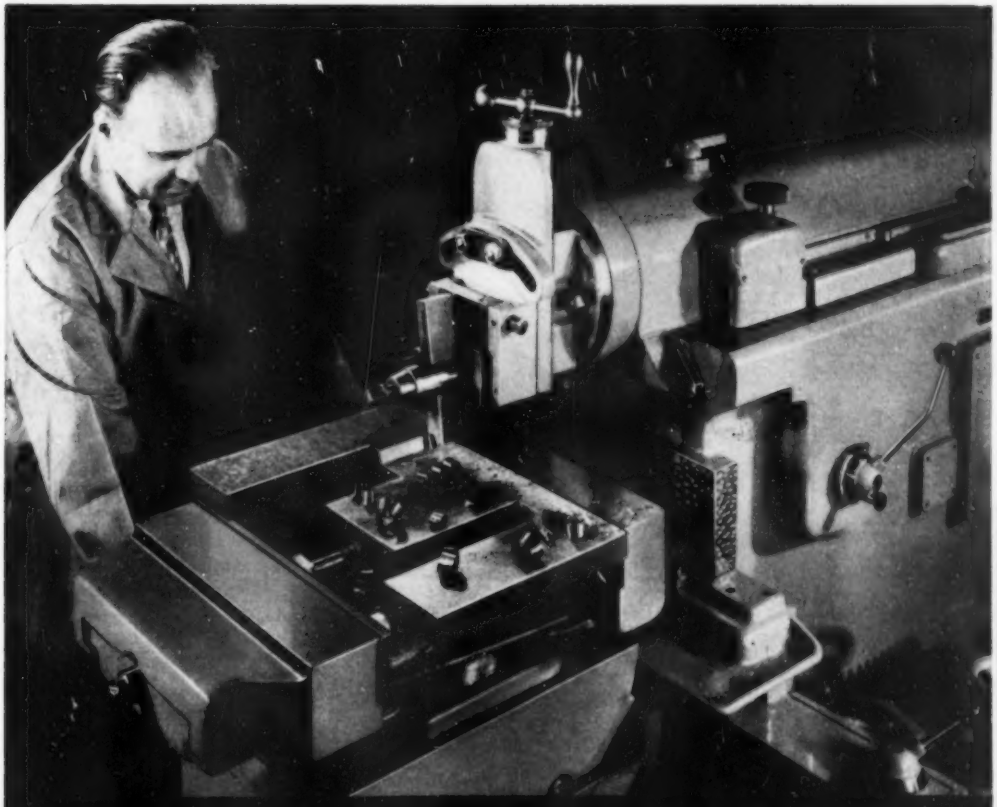
RED-E GRINDER-MILLING MACHINE DOGS for EVERY application

● Special exclusive RED-E features mean unmatched versatility for ***GREATER SAVINGS*** in time, labor, money. Quick change-overs, simple installation, finger-tip control, perfect balance, accuracy and ***adjustability*** assure greater economy, micro-precision and stepped-up production that you can't afford to pass up!



Complete range of sizes!
Send for the RED-E Bulletin, now!
GRINDER DOG *Specialists*
Since 1908

RED-E TOOLS READY TOOL COMPANY
548 Ironiston Ave. Bridgeport 7, Conn.



INCREASE YOUR OPERATING EFFICIENCY...

with ROCKFORD HYDRAULIC SHAPERS

Hydraulic drive permits you to change stroke lengths instantly, even while the shaper ram is in motion. It also gives you a wide range of cutting speeds and feeds, infinitely adjustable.

With flame-hardened and ground ram ways, Rockford Shapers assure long life and constant accuracy for maximum operating efficiency.

Ask a Rockford Machine Tool Co. representative to show you how you can increase your operating efficiency with Rockford Hydraulic Shapers.

520

Hy-Draulic

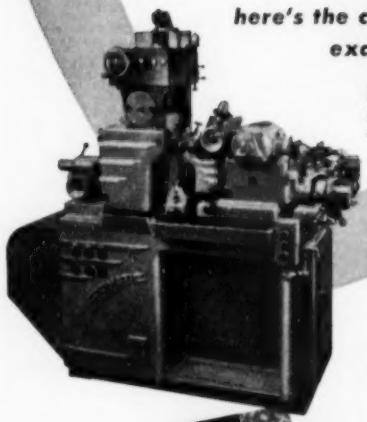
ROCKFORD MACHINE TOOL CO.

2500 Kishwaukee Street • Rockford, Illinois

NOW!
Crush Dressing
enables you to centerless grind small profiled parts from the **SOLID**

here's the blank . . .

here's the centerless ground piece, exactly shaped and sized!



RESULT: Faster production of precision parts formerly made on screw machines and automatics!

If you want fast, accurate profiling, if you want to save roughing time—*look into centerless grinding on a* DIVERSIMATIC! Grinds many shapes right *from the solid*, eliminates warpage from heat treat, produces close tolerances and excellent finish, with better output!

DIVERSIMATIC is the only centerless grinder equipped for CRUSH DRESSING...The amazing process which almost instantly *profiles* the wheel face and *keeps it dressed* to exact contour!

GET FULL FACTS!
Write for quotation and delivery!

ASK FOR THIS NEW FOLDER

DIVERSIFIED METAL PRODUCTS CO.
5125 Alcoa Avenue, Los Angeles 58, Calif.

HOW to cut your

TAPPING COSTS

• Tapping trouble in many cases can be traced to the improper choice of the tap for the job. Proper tap selection begins with analysis of the thread to be cut . . . material, size, tolerances, character, ultimate use, and number.

BETTER TAPPING

16 pages—25 cents each

This *American Machinist* Special Report will help you cut your tapping costs per threaded hole. This valuable article provides all the latest data on proper tap selection and application . . . from leading tap manufacturers and their largest users.

• Similar Special Reports on the following topics are also available.

THREAD CHASING
16 pages—25 cents each

•

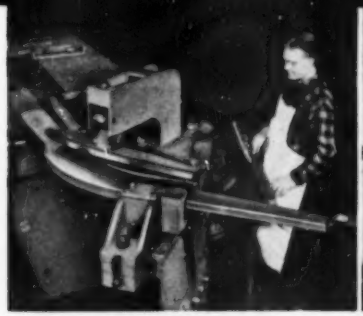
HOW TO MILL, ROLL, AND GRIND THREADS
24 pages—35 cents each

READER SERVICE DEPARTMENT
American Machinist
McGraw-Hill Building
New York 36, N. Y.

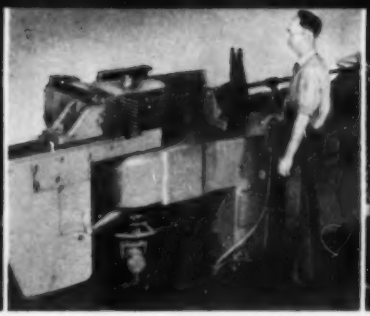
From the *American Machinist* Library of *Tips for Top Shop Men*

SPECIAL jobs take special doing. They're the most profitable places to try special tools, special coolants, special operators. Too often the tendency is to be content with any method that will do the job at all.

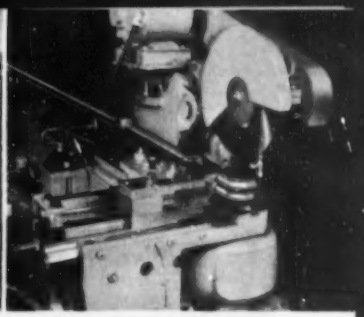
STUDY merchandising's technique for introducing a new product. It'll pay you to try the same methods when installing new equipment. You'll avoid resistance not only from workers but also from foremen.



HEAVY, TAPERED HOLLOW SECTION — Pieces fabricated from 2 tapered welded strips of 12 gauge steel stock are given a 34" radius bend and a 41° edge bend on a Pines Size 4 Bender.



STEEL RODS — Multiple groove die on Pines Size 3 Automatic Bender forms ten 7/16" x 67-1/4" steel rods simultaneously to a 22" radius for farm implements.



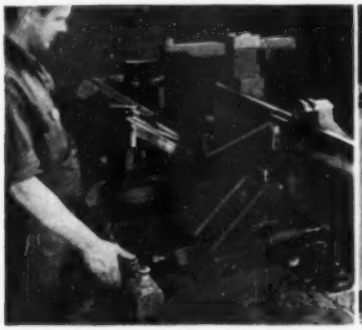
COPPER ELLS — 3/4" ells are formed to 7/8" c/l radius and cut off automatically two at a time from 20 ft. stock lengths on a Pines Size 3/4 Bender.

For NEW IDEAS in METAL FORMING

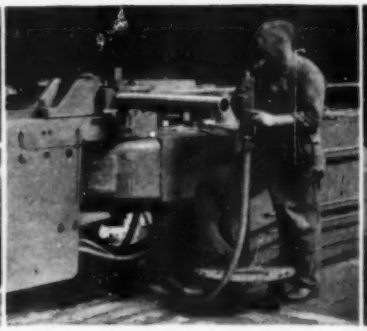
SQUARE TUBING—An eight foot length of SAE 4130 steel tubing 3" square, 1/4" wall, is compound bent to close tolerances. Segment mandrel maintains smoothness of the 10" inside radius bend.

investigate PRODUCTION BENDING the "PINES-WAY"

When you have a production problem of cold forming parts from round, square, rectangular, extruded or hollow stock to an even radius, or to different angles, chances are you will find the job can be handled more profitably on a Pines Automatic Bender. The examples shown here are only a few of the many different applications, in addition to ordinary tube bending, that are today handled efficiently on Pines machines. Production-wise and cost-wise, you will find bending the "Pines-Way" is a more accurate and profitable metal forming process. Investigate production bending today. Call on Pines engineers for assistance without obligation.



SQUARE STEEL BARS — Compound bends at each end and large center-radius helix are cold formed on a Pines Size 2 machine. Tooling costs reduced 75%, half of the production operations eliminated.



4" I.P.S. EXTRA HEAVY PIPE — Cold forming in place of hot bending on this Size 4 Pines bender eliminated a costly pickling operation at Allis-Chalmers' West Allis plant.

EXTRUDED ALUMINUM — Part of a production line set-up in a large aluminum fabricating plant, this small Pines Semi-Automatic bends an intricate extruded moulding for automobile window frames.

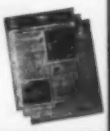
PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery

672 WALNUT • AURORA, ILLINOIS

WRITE FOR *Free* DATA SHEETS

To keep abreast with bending, ask to be placed on the mailing list for "Pines News", bi-monthly mailing piece that gives facts and figures on new unusual production applications.



BENDING • DEBURRING • CHAMFERING • THREADING MACHINERY

14 Benchmasters kick out 202,500 parts per day!

...paid for themselves in 30 days!

The Nutt-Shel Company, Glendale, California, manufactures an assortment of aluminum, steel and stainless steel self-locking anchor nuts and nut and bolt retainers for the aircraft industry.

Their five-day-weekly production is 1¼ million assemblies, 90% of which is produced on Benchmaster 4-ton punch presses... proving again that for high production and year-in, year-out dependability you can't beat a Benchmaster!

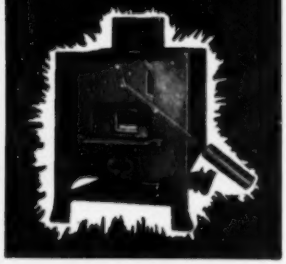
Write today for complete information on how the Benchmaster line of 1, 4 and 7½ ton punch presses can help you produce more.

benchmaster

MANUFACTURING COMPANY

1835 W. Rosecrans Avenue, Gardena, Calif.

BUZZER



FURNACES

No Blower or Power Needed FOR TEMPERATURES TO 2400° F.

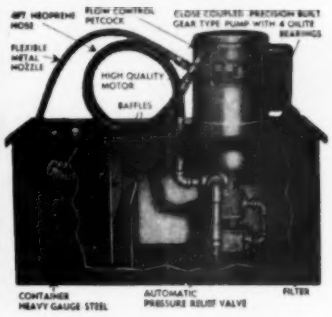
Just connect the BUZZER High Speed Muffle Furnace to your gas supply and it is ready for use. A temperature of 2400° F. is attainable in approximately 1½ hours. Special block for controlled furnace atmospheres make this furnace particularly adaptable for high carbon and alloy steels. Special BUZZER burners have wide range of control.

Send today for catalog showing this furnace in bench and floor models, as well as other types of furnaces, burners and other equipment.

CHARLES A. HONES, INC

GRAY-MILLS

PUMPS AND COOLANT SYSTEMS

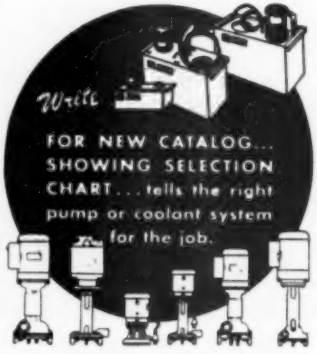


FOR GREATER PRODUCTION EFFICIENCY

PROPER application of coolants means increased production and time and tool savings. You can have these advantages for every machine—small, large, and special—with Graymills Portable Coolant Systems.

They can be installed in a few minutes, are modern in design, and of heavy duty construction with built-in automatic pressure relief valve on gear pumps.

Sturdy high pressure gear models . . . smooth high volume centrifugal types in 1/25 to ½ HP ratings, 1 gal. to 70 g.p.m. with tank capacities from 5 to 38 gals. Also immersion type centrifugal pump and motor units.



MOST INDUSTRIAL DISTRIBUTORS STOCK STANDARD UNITS.

GRAYMILLS CORPORATION

ASK

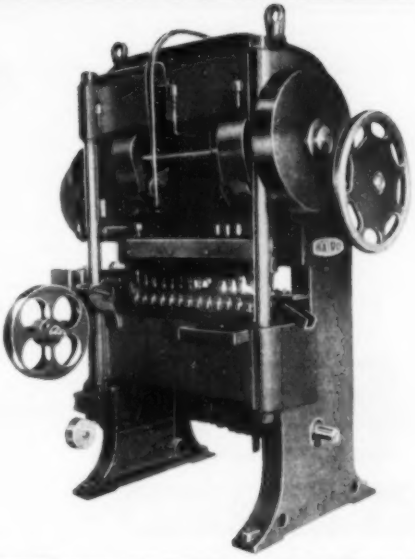
BAIRD

ABOUT IT!

HIGH PRODUCTION TOOLING

BAIRD MULTIPLE TRANSFER PRESS

completes window shade part in one operation . . . 60 pieces per minute

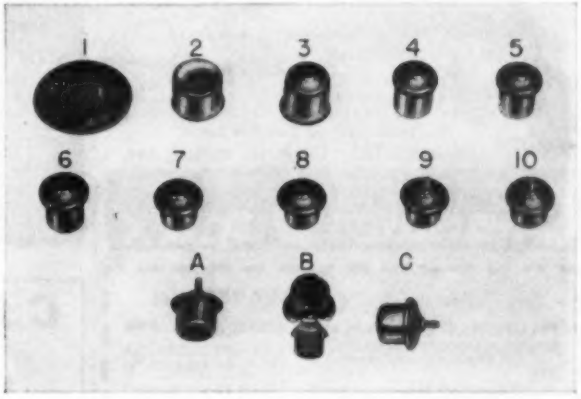


The Multiple Transfer Press is standardized in 12 sizes, with rated working pressures from 5 to 55 tons. Coiled stock (2½" to 4" width) is automatically fed to the press and, after completion of the stroke, the work quickly progresses to die stations by means of transfer fingers. Operations for which we can tool your job may include blanking, drawing, piercing, embossing, slitting, trimming, broaching, sizing, hexing, forming, etc.

Simply stated, the press combines, in a single cycle, operations that might otherwise require several smaller machines with an operator for each. Note the interesting job shown below . . . typical of many set-ups that turn out millions of parts at extremely low cost.

SEQUENCE OF OPERATIONS
10-STATION DIE SET

This window shade part is completed in one operation, as shown at "A" and "C". A 10-station die set is used. "B" shows part cut open to reveal the section. The part starts at station No. 1 by producing the blank. Drawing and forming operations continue to station No. 7, where the final sizing takes place. At No. 8 a hole for the pin is pierced; at No. 9 pins are automatically hopper-fed to the work, assembled and riveted. Stamping of the Trade Name is performed at No. 10. Material is C. R. S. zinc plated. Production: 60 pieces per minute.



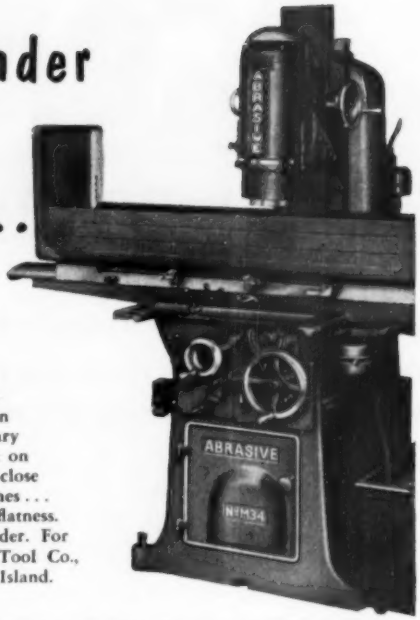
WANT LOW COST PRODUCTION?

Ask Baird about it!

SEND FOR TRANSFER PRESS BULLETIN

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

.....the toolroom grinder with production potential.....



ABRASIVE NO. M-34 VERTICAL SPINDLE SURFACE GRINDER brings big-grinder productivity down into the small grinder class. You can't beat it for quick grinding of flat work — such as dies, washers, punches, spacers, parallels, chasers, raising blocks, production parts. Abrasive No. M-34 has a table working surface 24" long x 8" wide with 12" of vertical capacity. For precision finishing of small production parts, this surface grinder can be equipped with circular grinding attachment and rotary magnetic chuck. Whatever the work, you can count on Abrasive No. M-34 to hold size within extremely close tolerance limits . . . to produce very fine surface finishes . . . and to maintain a high degree of parallelism and flatness. Get full details on this versatile surface grinder. For descriptive bulletin, write Abrasive Machine Tool Co., 8 Dunellen Road, East Providence 14, Rhode Island.

ABRASIVE ACCURACY BOOSTS PRODUCTION

Abrasive Quality is Reflected in the Finish of Your Product

A GOOD STEER

To Better Boring and Facing

Boring, Facing, Turning, Grooving, Undercutting

Re-designed, Added Features—Six Models In ONE Toolhead

ALL Sizes Have Power Feed for Facing

Write Today for Complete Details

CHANDLER TOOL COMPANY, MUNCIE, IND.

COMBINED BORING & FACING TOOL HEADS

Chandler-Duplex

FOR OVER 50 YEARS

MOLINE "Hole-Hog"

SPECIALLY DESIGNED

MACHINE TOOLS

HAVE CUT PRODUCTION COSTS FOR AMERICAN INDUSTRY

MOLINE TOOL CO. HOLE-HOG MOLINE, ILLINOIS

DRILLING
BORING
HONING
TAPPING and
Special Machines

ACROMARK **ENGRAVES** DIES, STAMPS, PARTS, NAME-PLATES, SIGNS, HOBS, AND MAKES MEMORIAL TABLETS.

ASK ABOUT ACROCEL PORCELAIN ENAMELED PLANT SIGNS CARRIED IN STOCK

ACROMARK company

CAST BRONZE TABLETS & SIGNS

7-13 MORRELL ST., ELIZABETH 4, N. J.

CENTERING MACHINES

• HAND • SEMI-AUTOMATIC • AUTOMATIC

Special Machinery

HEBERT Equipment Co. • Romeo, Mich.

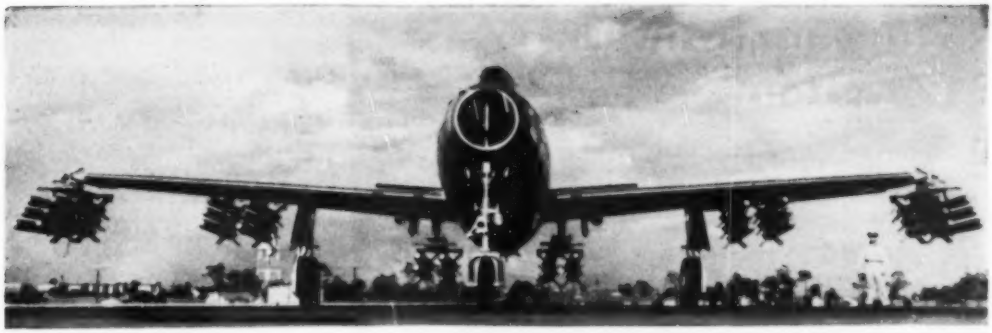
You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES No. 4 to 1" H.C. to all S.A.E. sizes.

Here is the faster, more precise way of transferring open end blind screw holes—make savings in "nuts-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws mated in combination holder and wrench —no other tools needed. Cut more work now—save money too!

HEIMANN MFG. CO. • URBANA, OHIO



Free-Machining ENDURO Flies with the Thunderjets

Parker AN fittings, manufactured of Type 316 ENDURO Stainless Steel by Parker Appliance Company, Cleveland, Ohio, fly with Republic Thunderjets and with many other aircraft.

Machined fittings for aircraft hydraulic control systems must, above all, be strong and tough. They must contain pressures as high as 3000 psi and possess high safety margins. They must fight off all attacks of corrosion and fatigue. They must resist the effects of sudden changes in temperature and atmospheric pressure.

The material to provide all these qualities, yet be economical to forge and to machine? It's ENDURO Stainless Steel, available in free-machining grades, either hot rolled or cold drawn bars.

ENDURO responds uniformly to forging—and, as these fittings indicate, is readily machinable.

ENDURO Cold Finished Bars are processed by Republic's Union Drawn Steel Division to provide close tolerances, accuracy of section, uniform soundness and fine surface finish. Two grades are approximately 90% as machinable as Bessemer screw stock.

To help you use ENDURO to cut costs and speed production of stainless steel bar parts, Republic offers you prompt, competent metallurgical assistance. Just write:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

See and Hear "THE STORY OF STAINLESS"

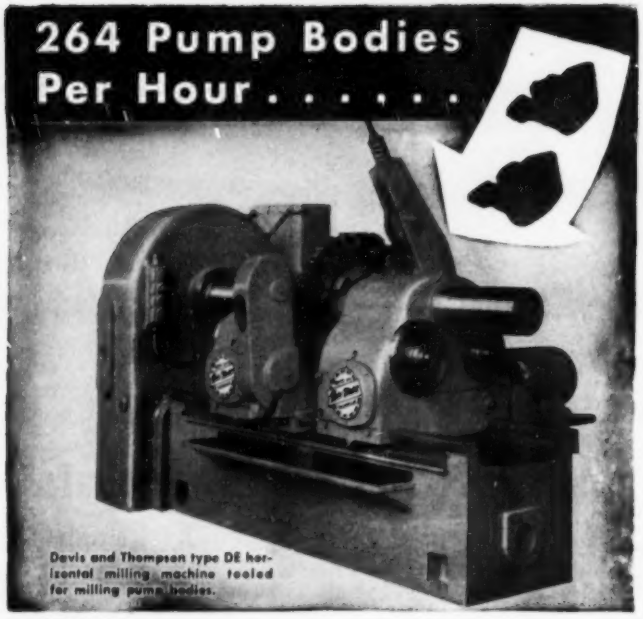
Full-color, 16 mm sound film—27 minutes running time. Dramatic . . . historic . . . interesting. Available to qualified groups without charge. Requires 16 mm sound projector. Send name of organization, type of projector, requested date to Ideal Pictures Corp., Dept. T-4.6, K. So. Water St., Chicago 1, Ill., or write Republic Steel Dept. R, Cleveland 1, O.

Republic ENDURO® FREE-MACHINING STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

264 Pump Bodies Per Hour . . . . . .



Davis and Thompson type DE horizontal milling machine tooled for milling pump bodies.

1-A Standard Horizontal Milling Machine

Oil pump bodies requiring high degree of finish and high production are rough and finish milled on both sides simultaneously with this Davis and Thompson type DE milling machine. Production is 264 pieces per hour.

Patented Angular Spindle Adjustment Allows "Toe Cutting"—Maintains Fine Finish at High Production

The finishing spindle is provided with an exclusive D&T design which allows angular adjustment. This in turn results in "toe-cutting" and eliminates "drag" of the cutter over the finished surface. Both roughing and finishing spindles have micrometer endwise adjustment.

A Basically Standard Machine Employing Roto-Matic Principle For High Production Special Milling

Like all D&T machines this model DE is designed for long life and trouble-free operation. Each head has independent drive. There is backlash take up to mandrel. Anti-friction bearings throughout. Rapid traverse between cuts can be incorporated.

Free Data will be furnished upon request.

DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

Microstructure determines tool life . . .

U. S. AIR FORCE MACHINABILITY REPORT 1951

This *American Machinist* Special Report summarizes recently released data from the $100,000 machinability-research project conducted by Curtiss-Wright and other companies for the United States Air Force.

You will find particularly valuable, as a key to estimating the tool life cutting speed of any steel, this report's comprehensive chart of 12 steel structures under four metallurgical conditions.

Copies of this 8-page Special Report, which includes information on machinability as influenced by heat-treating and alloying, are available at 15 cents each.

Write for an editorial reprint order form listing titles and costs of other informative Special Reports.

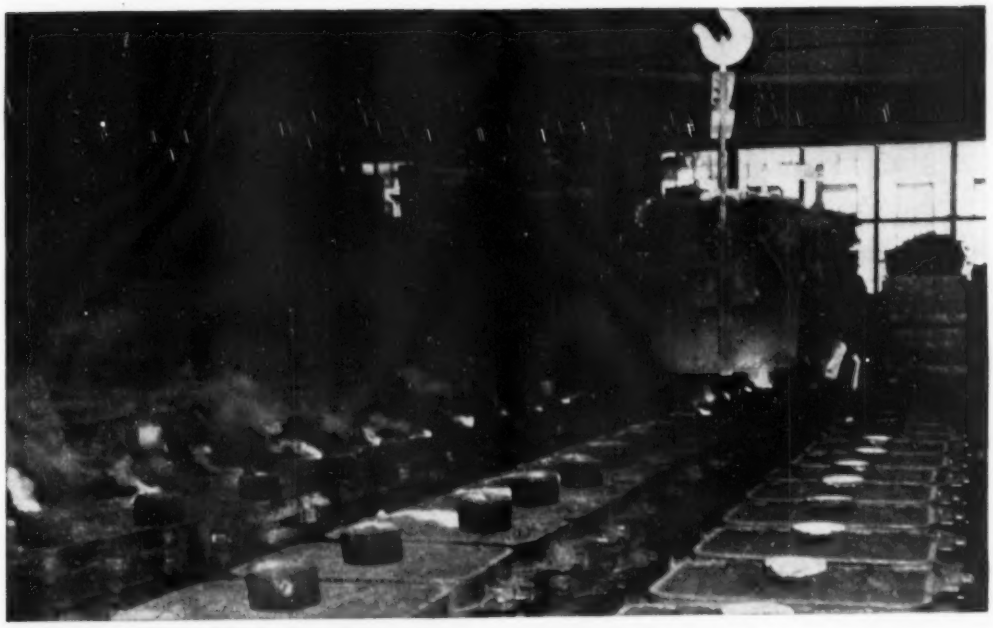
Reader Service Department

American Machinist

McGraw-Hill Building
New York 36, N. Y.

From the *American Machinist* Library of *Tips for Top Shop Men*

WHAT you say and what you write must agree. You can't post a memorandum that lays down a policy, then nullify it by word of mouth—and vice versa. If you do, the least criticism you'll get is that you're changeable-minded. And charges that you're two-faced and a liar are more likely.



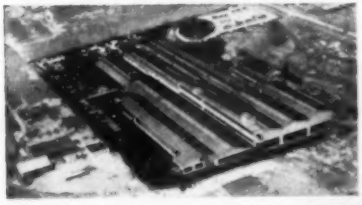
ASK THESE MEN OF RIVERSIDE TO HELP SOLVE YOUR

STEEL OR GRAY CASTING PROBLEMS

Riverside Foundry is ready to give you excellent service on cast armor and all types of QQS 681-B materials. **In fact, any steel casting specifications for which your contract might call.** We have a full staff of men who have spent years producing ordnance material.

Our customers include many great names of American Industry: Chrysler, American Locomotive, International Harvester, Fisher Body and Ford Motor Company. **Ask them about Riverside.**

Call or write us at Riverside today.



The big modern Riverside Foundry at Bettendorf, Iowa has the best equipment to do the best job.

For a dependable qualified source of steel casting requirements, see Riverside. You give us your drawings. The rest of the job is ours. Save yourself time, worry and loss of production. We are ready to do a complete job for you on any casting requirement.

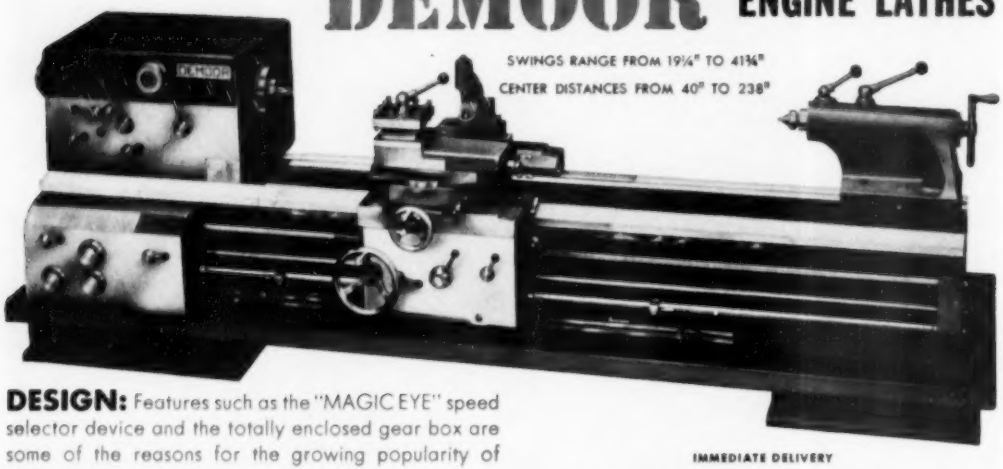
IOWA

IOWA'S LARGEST INDEPENDENT FOUNDRY

Riverside Foundry

Bettendorf, Iowa Davenport Exchange 6-3571

DEMOOR ENGINE LATHES



SWINGS RANGE FROM 19¼" TO 41¾"
CENTER DISTANCES FROM 40" TO 238"

DESIGN: Features such as the "MAGIC EYE" speed selector device and the totally enclosed gear box are some of the reasons for the growing popularity of these machines.

CONSTRUCTION: Manufactured by a firm with a hundred years experience in building machine tools is the reason for the outstanding workmanship.

ECONOMY: The low cost of these complete machines will surprise you.

IMMEDIATE DELIVERY

For Information and Specifications Consult Dept. A

STOKVIS ✿ EDERA & CO., INC.
95 MADISON AVENUE, NEW YORK 16, N. Y.
Telephone MUrray Hill 3-4935

WHY PAY FANCY PRICES FOR MAGNETIC CHUCKS?

Grip work tightly for wet or dry grinding.
Supplied with connections for either 110 or 220 volts D.C.

5½"x13" **$55.37**
6½"x18" **$73.40**
8"x24" **$127.03**
10¾"x37" **$234.81**

GUARANTEED WATERPROOF

DEMAGNITIZERS

A single pass over the stationary poles completely demagnetizes work. 110 volt A.C. Model B-2 for large work, 7½" x 13½" x 8½". Ship. wt. 55 lbs. **$73.45**

Model J-1 for small work, 7½" x 7½" x 6½". Ship. wt. 35 lbs. **$47.83**

RECTIFIERS

A.C. input 110 volts, D.C. output 110 volts. P-1 for 5½" x 13" chuck 0.8 amps. **$45.04**
P-2 for 6½" x 18" chuck 1.0 amps. **$52.30**
P-3 for 8" x 24", 10¾" x 37" chuck 1.0 amps. **$69.73**

DEMAGNETIZING SWITCHES

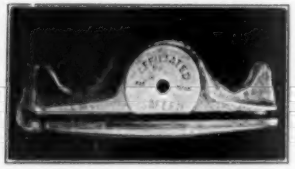
For 5½" x 13" and 6½" x 18" sizes **$10.35**
Field discharge type for 8" x 24" and 10¾" x 37" **$18.90**

Order from your industrial supply distributor or order direct, giving name of your distributor.

L-W CHUCK COMPANY 2550 ST CLAIR AVE. CLEVELAND 14, OHIO

Every Punch Press Operator *Needs*

THE INDISPENSABLE TOOL FOR EVERY PLANT **SAFEED** Patented



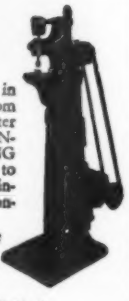
Feeds ferrous, non-ferrous strip or sheet . . . faster, safer, prevents accidents. Use for stamping, shearing. Right or left hand non-slip fitted grip, self-adjusting. Sturdy, hardened work surfaces. FULLY GUARANTEED. Write today. Early delivery.

AFFILIATED MACHINE & TOOL CO.
260 WEST ST., NEW YORK 13, N. Y. CAnal 6-4937

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Sillman Ave., Bridgeport, Conn., U. S. A.

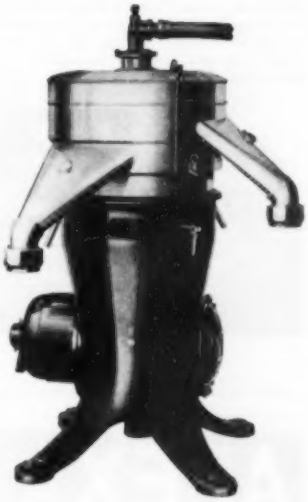
NO GETTING AROUND IT

A DE LAVAL OIL PURIFIER WILL PROTECT HYDRAULIC MECHANISMS

A De Laval Oil Purifier removes all moisture from hydraulic oil by means of centrifugal force. This is an important safeguard to good performance for any hydraulic press or other hydraulic mechanism, for even a small amount of water can ruin a mechanism, causing valves to stick and leather seals to harden.

De Laval centrifugal machines likewise remove the solid impurities in oil that score cylinders and do other costly damage. They are more effective than any other purification means . . . and save tools . . . dies . . . work . . . machines from damage.

You save more than the oil when you purify with De Laval.



Write for Bulletin MM-1

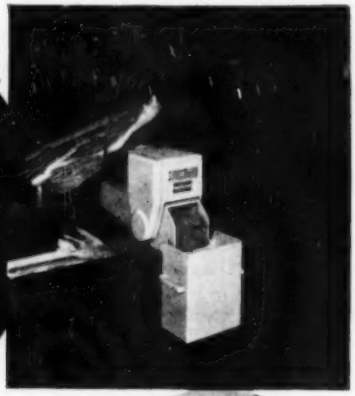
THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL

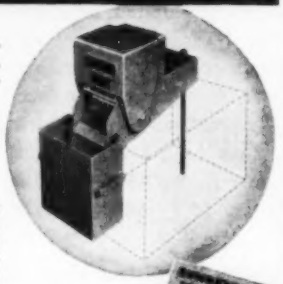
PURIFIERS AND CLARIFIERS FOR FACTORY OILS

NEW!

Compact, Efficient Coolant Separator for Grinding, Honing and Gear Shaving Machines



This completely automatic coolant cleaning unit will give you longer wheel or tool life, better finishes, less down time and fewer rejects. The unit requires no attention and little or no maintenance. It does not clog or require shut downs for cleaning or sludge removal.



Easily Installed Without Additional Piping

An important feature of this magnetic coolant separator is that it can be dropped into position on most open type coolant tanks. No additional piping is required. Install one on your present equipment and compare its efficient operation with other units.

FREE ADDITIONAL DATA

This folder will give you the complete facts on this new 40 gpm magnetic coolant separator. Write for your copy today. Ask for bulletin 125-M.

SUNDSTRAND MAGNETIC POWER-GRIP

SUNDSTRAND
Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1020-9th ST. • ROCKFORD, ILLINOIS

APEX INSERTED-BLADE METAL-CUTTING TOOLS

Here's a "BIG BULL" Cutter

for your

HEAVY DUTY JOBS

APEX offers many cutters for many jobs. Here's one that takes a big chip fast. It can be had with H.S.S., Stellite, Cobalt or Carbide tipped blades. These blades adjust automatically in two directions. No damage to carbide tips. Diameters from 8" to 24". We also make cutters for lighter work. Write for catalog.

APEX TOOL & CUTTER CO., Inc., Shelton 10, Conn.

SAVE VALUABLE ALUMINUM!

Cutbacks of aluminum for civilian consumption, and its importance in defense production, increase the necessity of economical and efficient methods for working this widely used non-ferrous metal. The *American Machinist* Special Report, "How to Work Aluminum and its Alloys," explains what you can do to make your supply of aluminum go further.

This valuable 16-page article is a summary of the latest developments in fabricating this vital metal . . . the characteristics of aluminum alloys . . . machining methods . . . sheet-working methods . . . casting and forging . . . joining methods . . . cleaning and finishing. Reprints of this timely article are available at only 25 cents per copy.

Write Reader Service Department:

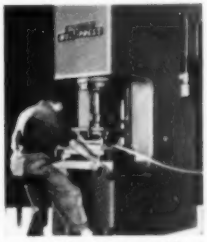
American Machinist
McGraw-Hill Building
New York 36, N. Y.

new MULTIPRESS®

"touch control"

RAM MOVEMENT AND PRESSURE RESPOND INSTANTLY—IN DIRECT PROPORTION TO THE WAY YOU MOVE OR PRESS DOWN ON THIS HAND LEVER

PERFECT RAM CONTROL IN THE PALM OF YOUR HAND



Multipress is built in eight frame sizes and in one-ton to 50-ton capacities—all available with Touch Control.

Now you can have all the *operating* advantages of Multipress plus quick, sure, direct-action "Touch Control". The slightest movement of this "slave-type" control is converted instantly and directly into ram movement . . . the ram starts, stops, reverses, speeds up, slows down, or exerts pressure in *exact, split-second relation* to every move of the hand lever. Every added ounce of pressure on the lever is instantly *multiplied* into added ram effort—in an exact ratio. It is as though the operator's hand and arm move the ram itself with the power of a skilled giant. Rapid-fire "jiggling" of the lever brings equivalent "vibratory" pressure applications on the work.

Pressures are quickly and accurately shown on the dial gauge. The operator can build up pressures quickly or slowly, to any predetermined need. And because ram movement and pressure are so accurately related to every movement of the hand lever, he quickly gets the "feel" of any repeated operation.

Stroke length is fully adjustable at both its upper and lower limits, and maximum tonnage can also be preset to any pressure within the limits of the press.

With "Touch Control" the fast, smooth oil-hydraulic accuracy of Multipress is made even more closely adaptable to all types of production jobs where complete control of the ram is needed, as in straightening operations.
Write for full details today.

The DENISON Engineering Co.
1164 Dublin Road Columbus 16, Ohio

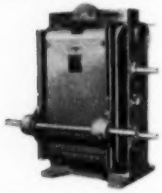
DENISON Hydr OIL ics

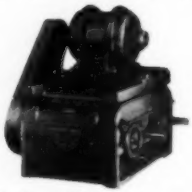
REEVES

Variable Speed Transmission*

* The original, mechanically correct unit for providing complete, stepless speed adjustability.

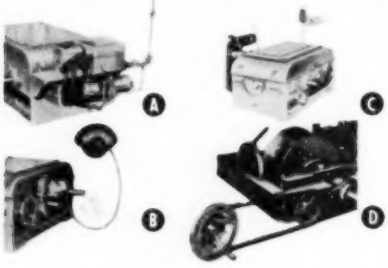
Available in a wide choice of designs and sizes





Vertical and horizontal models, open or enclosed, with motor base, countershaft (shown at left), or integral gear reducer, where desired. "Internals"—actual speed-changing mechanism without frame or case—also available for incorporation within machine framework. All units offered in fractional to 87-hp sizes; speed ratios, 2 to 1 through 16 to 1.

Controls and indicators for every specialized need



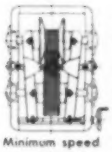
Handwheel control standard. Hydraulic automatic (A), electric tachometer (B), electric remote (C) and extended handwheel (D) are among the many controls and indicators available.

Select any speed–

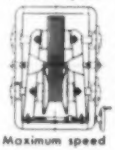
accurately and positively—with the turn of a handwheel or touch of a button

REEVES Variable Speed Transmission, used more widely in more different industries than any other variable speed drive, assures *accurate, positive* delivery of any desired speed over a wide range, with the turn of a handwheel or touch of a button . . . without stopping the machine. It makes use of the machine's full production potential . . . allows it to handle more different shapes, sizes, and materials . . . utilizes the highest skill of every operator.

For higher output and improved, uniform quality of production, equip the machines you buy or build with **REEVES** Transmissions. A wide selection of designs, sizes, speed ratios, and controls assures the right installation for every need . . . sound design and rugged construction assure years of trouble-free, profitable operation. Check the features shown opposite and below, and for full details send right away for your free copy of catalog, No. A82-G.



Minimum speed



Maximum speed

REEVES Variable Speed Transmission embodies the proved operating principle of a V-belt driving between two pairs of cone-shaped discs, mounted on parallel shafts and adjustable to form an infinite number of driving and driven diameters. One shaft receives power at constant speed from motor, line shaft, etc. Other shaft delivers power at infinitely variable speeds to driven machine. Each speed setting is held without fluctuation.

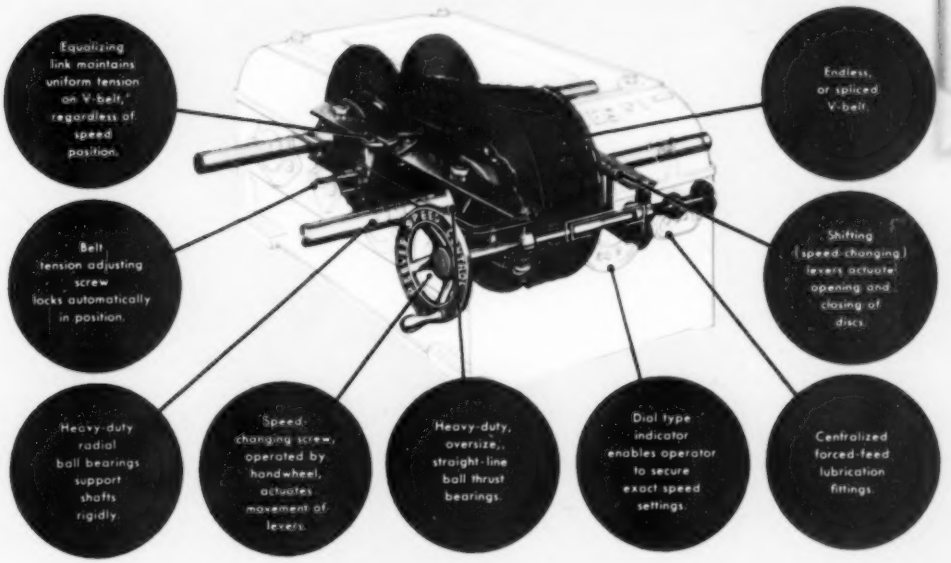
REEVES PULLEY COMPANY • COLUMBUS, INDIANA

Recognized leader in the specialized field of variable speed control

Accurate · Variable

REEVES

SPEED CONTROL


Equalizing link maintains uniform tension on V-belt, regardless of speed position.
Belt tension adjusting screw locks automatically in position.
Heavy-duty radial ball bearings support shafts rigidly.
Speed-changing screw, operated by handwheel, actuates movement of levers.
Heavy-duty, oversize, straight-line ball thrust bearings.
Dial type indicator enables operator to secure exact speed settings.
Centralized forced-feed lubrication fittings.
Shifting (speed-changing) levers actuate opening and closing of discs.
Endless, or spliced V-belt.

"Maximum Tool Life... Minimum Down Time... Year in and Year Out"

says

E.W. BLISS CO.

about

ADAMAS Carbide TOOL TIPS

E. W. Bliss, Toledo Division, secures 95% of its tungsten carbide tool tips from ADAMAS . . . with good reason! Engaged in machining large Meehanite castings, steel, steel forgings and bronze, Bliss finds it economical to fabricate and repair its own tools. Their experience has shown that using ADAMAS Carbide pays off—year in and year out, on all types of metals, machines, and jobs. Where BIG work is being done, ADAMAS Carbide is the dependable "work horse."

This five year performance record of consistent quality and good service is a typical ADAMAS user's experience. Specify ADAMAS—you will get steady daily production advantages and lick most of the difficult marginal jobs as well.

Send for the helpful group of "ADAMAS Aids to Carbide Users"

Photograph courtesy of E. W. Bliss Co.

Specify ADAMAS

CARBIDE CORPORATION
HARRISON, NEW JERSEY

PRODUCERS OF TUNGSTEN CARBIDE TOOL TIPS, DIES AND WEAR PARTS

STANDARDIZE WITH

OHIO

STOCK GEARS AND SPEED REDUCERS

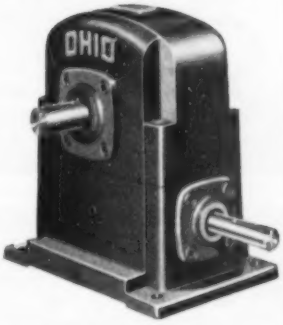
Today's expanding production calls for quality standards — that's why experienced designers and maintenance engineers recognize the importance of OHIO Stock Gears and Reducers.

"Standard Stock" items save vital days and weeks.

"Standard Stock" is economical – eliminating extra cost "Made to Order" specials.

"Standard Stock" means faster replacement.

Those men responsible for today's high-speed emergency operations specify and depend on OHIO Stock Gears and Reducers. Investigate the possibilities of adapting OHIO Gear to your product. Call your nearest distributor or write direct.



DISTRIBUTORS AND REPRESENTATIVES

*Akron, Ohio
Hardware & Supply Co.

*Baltimore, Md.
L. A. Benson Co., Inc.

*Brooklyn 6, N. Y.
(Gears) Northside Leather Belting Co., Inc.

Buffalo, N. Y.
F. E. Allen
*S. H. Pooley Belting Co.

*Chicago 23, Illinois
Apex Power Equipment Co.

*Chicago 7, Illinois
Schrade-Batterson Co.

*Cincinnati 14, Ohio
Metzger Machine Co.

*Cleveland 2, Ohio
J. A. Shomer Co.

*Cleveland 10, Ohio
Ohio Gear Co.

Dayton, Ohio
E. C. Hawk

*Detroit 2, Michigan
Abrasive and Supply Co.

*Erie, Pennsylvania
Cohen Auto Parts Co., Inc.
Industrial Supply Division

*Findlay, Ohio
Bearing & Transmission Co.

*Grand Rapids 2, Mich.
F. Raniville Co.

*Hagerstown, Md.
Hagerstown Equipment Co.

Hoboken, N. J.
Crown Industrial Supply

Houston 3, Texas
Behring's Bearing Service, Inc.

*Indianapolis, Indiana
A. R. Young

*Kansas City 16, North Mo.
Sesco Engineering & Supply Corp.

*Los Angeles 21, Calif.
J. W. Minder Chain & Gear Co.

Louisville 2, Ky.
Alfred Halliday

*Massillon, Ohio
Hardware & Supply Co.

*Memphis 2, Tenn.
Memphis Bearing & Supply Co.

*Miami 9, Fla.
General Equipment & Supply, Inc.

Milwaukee 11, Wisc.
Albert F. Korf & Co.

*Minneapolis, Minn.
Industrial Supply Co.

*Muskegon, Mich.
Lakeshore Machinery & Supply Co.

*New Orleans, La.
(Gears) R. J. Tricon Co.
(Reducers) Woodward Wight & Co., Ltd.

*New York, N. Y.
(Reducers) Patron Transmission Co.,
(Gears) Atlantic Gear Works

*Paterson 4, N. J.
(Gears) Bernstein Bros. Inc.

Pawtucket, Rhode Island
George G. Pragst

*Philadelphia, Pa.
Rothman Belting & Equipment Co.
Robert L. Latimer Co.

*Piqua, Ohio
Bornell Supply Co., Inc.

*Pittsburgh 30, Pa.
Standard Machinists Supply Co.

*Portland 14, Oregon
J. W. Minder Chain & Gear Co.

*Rochester 4, N. Y.
H. M. Cross and Sons, Inc.

*San Francisco, Calif.
The Adam Hill Co.

*St. Louis, Mo.
The Essmueller Co.

*Syracuse, N. Y.
U. and S., Inc.

*Toledo 12, Ohio
G. & J. Supply Co.

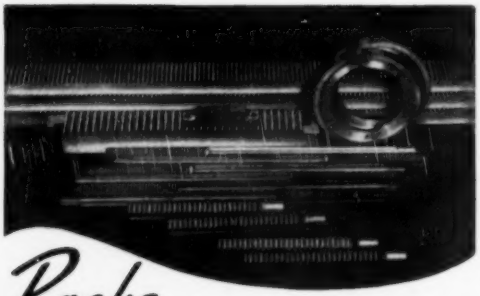
IN CANADA *Montreal, Quebec,
John Braidwood & Sons, Ltd.

*Stocks Carried.

OHIO GEARS

ESTABLISHED 1915
THE OHIO GEAR CO.

1326 EAST 179TH STREET
CLEVELAND 10, OHIO



Racks.. FOR INDUSTRIAL USE —

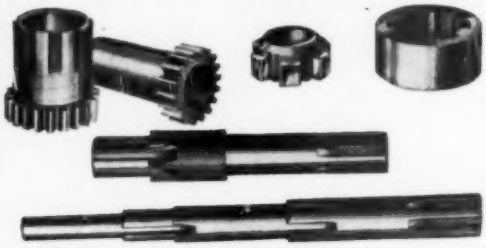
Stahl precision is embodied in these racks, which are made in all shapes and up to 20 feet long, 3 DP. Flawless in operation, they are fabricated to your exact specifications and at prices that will please you. Stahl's skill and experience, with facilities that insure quick delivery, are at your disposal. For the finest in racks or gears it will pay you to get Stahl's estimate first.

SPURS TO 72" PD, 1 DP
BEVELS TO 54" PD, 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP
CONTINUOUS-TOOTH HERRINGBONE TO 60" PD, 2 DP
SPROCKETS TO 72" PD, 2 1/2" CP
RACKS TO 20 FT. LONG, 3 DP
SILENT GEARS: RAWHIDE, BAKELITE, FABROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

Stahl

GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland 14, Ohio

If you use GEARS...



Regardless of quantity or type, you'll profit by specifying Adams custom made gears for your product. Made on the most modern gear cutting machines, Adams gears are quality controlled to guarantee exact conformance to your specifications. Write for details.

the ADAMS line . . .

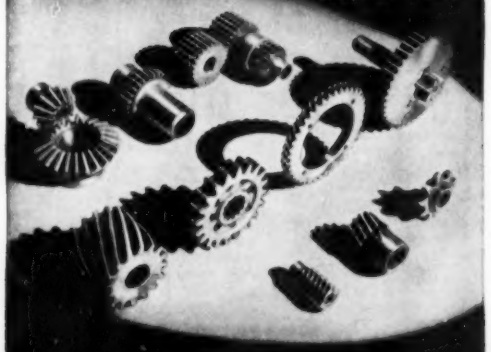
SPUR GEARS	INTERNAL GEARS (Spur and Helical)	SHAVED TOOTH GEARS (Spur and Helical)
BEVEL AND MITER GEARS	RATCHETS	GROUND THREAD WORMS
WORMS AND WORM GEARS	SPLINED SHAFTS	RACKS
SPROCKETS	LEAD AND FEED SCREWS	

The ADAMS Compa
Dubuque, Iowa, U. S. A.
ESTABLISHED 1883

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS

25th Year of Continuous
GEAR *Production*
for Aircraft and Industrial Fields



A complete plant equipped with over one hundred major machine tools for gear production.

Territories Available for Sales Representatives

ACME GEAR COMPANY
5-17 47th ROAD, LONG ISLAND CITY 1, N. Y.

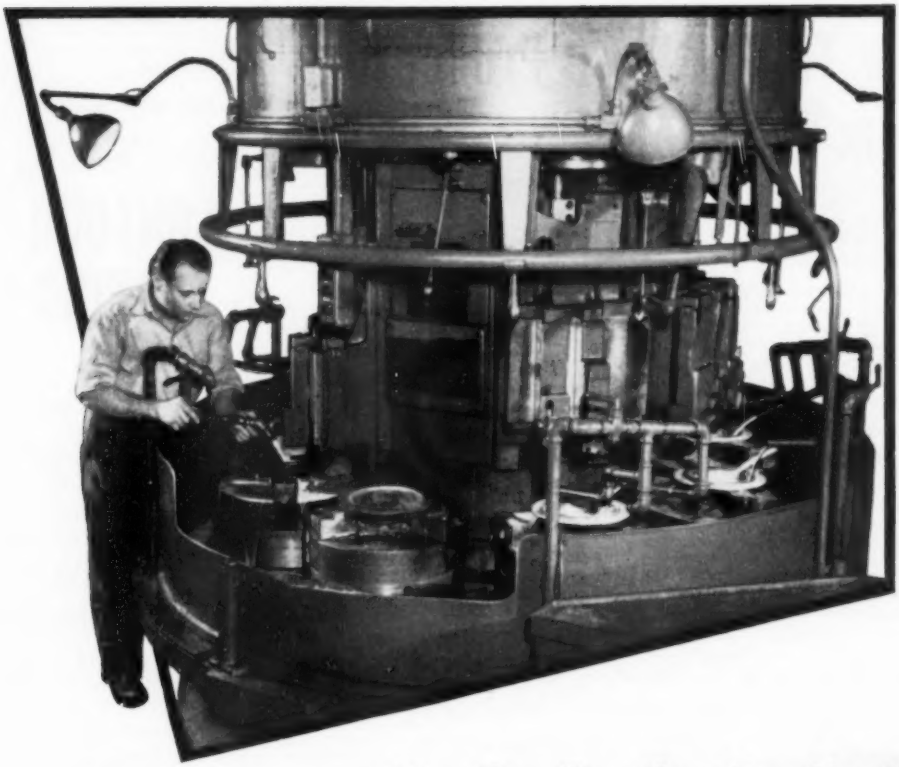
CAMS

BLAIR TOOL & MACHINE CORP.
119-06 15th AVENUE COLLEGE POINT, L.I., N.Y.

ATLANTIC GEARS

SPUR - SPIRAL - WORM - BEVEL GEARS
GENERATED WITH PRECISION ON MODERN EQUIPMENT
Send Samples or Blueprints for Quotation

Call CA 6-1440
ATLANTIC GEAR WORKS, INC.
200 LAFAYETTE ST. • NEW YORK 12, N. Y.



Quantity Production . . .

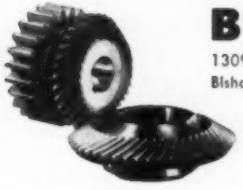
• Quantity production of identical gears offers a challenge that we here at BRAD FOOTE are eager to accept.

• Multiple spindle machines, duplicate machines, numerous and varied machines, every machine that's needed—PLUS men of long experience making close tolerance gears . . . these factors make it possible for us to confidently accept such a challenge.

• When you specify BRAD FOOTE gears, you do so with the knowledge that each gear will be made to exact specifications; that every gear of a quantity will be identical in structure, in size, and in appearance; that each operation on every gear will be performed by BRAD FOOTE people in BRAD FOOTE shops. No one will share our responsibility.

• You will be satisfied with the BRAD FOOTE gears you buy because they will give long, economical service on the equipment you operate, or on the machines you sell to others.

• Your inquiries are invited.



BRAD FOOTE GEAR WORKS, INC.

1309 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • OLympic 2-7700

subsidiaries

AMERICAN GEAR & MFG. CO. • Phone: Lemont 920 • Lemont, Illinois

PITTSBURGH GEAR COMPANY • Phone: ATlantic 1-9950 • Pittsburgh 22, Pennsylvania

How To Get More Production From Your Taps

Now you can get up to six times more production from taps used in your plant. This amazing increase in tap performance is made possible by a proven method of precision tap sharpening.

PRECISION TAP SHARPENING EXPLAINED

Precision sharpening consists of accurately grinding each tap to provide for uniform spacing of cutting edges, accurate hook angle on each cutting edge, and concentric chamfers. It makes possible an exact duplication of a previous grind.

THE BLAKE METHOD OF TAP SHARPENING

The only combination of machines on the market today which allows you to sharpen taps with this high degree of preciseness is the Blake Flute Grinder and the Blake Tap Chamfer Grinder. These two machines, used in conjunction with each other, enable you to get greatly increased production from your taps. They also help reduce tap breakage and increase effective tap life six times or more.

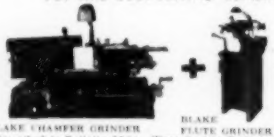
PRECISION SHARPENING IN OPERATION!
A ⅜"-24 four-fluted tap is ground accurately on chamfer with the No. 1 Blake Tap Chamfer Grinder.

SEND FOR COMPLETE INFORMATION

To get additional information on this subject, write to us for your free copy of the *Machinery* article, "Why Taps Should Be Sharpened Precisely". Technical details about both Blake tap sharpening machines are available in illustrated folders listed below. Ask for them!

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!



BLAKE CHAMFER GRINDER (Described in Bulletin 551)

BLAKE FLUTE GRINDER (Described in Bulletin 651)

ACCURATE, TRUE-CUTTING TAPS
LESS TAP BREAKAGE
600% MORE PRODUCTION PER TAP
UP TO 75% REDUCTION IN TAP COSTS

Write for details about both machines!

EDWARD BLAKE COMPANY 435 CHERRY ST., WEST NEWTON 65 MASSACHUSETTS

BLACK DIAMOND PRECISION DRILL GRINDERS . . . WALTHAM CUTTER SHARPENERS . . . SURFACE FINISH STANDARDS

From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T flaunt your greater income or privileges before your subordinates. No matter how much they like you, their resentment and envy will do you more harm than the flaunting does your ego good.

REMEMBER that human problems need careful study just as do engineering problems. Man is multi-motivated and one prescription won't cure all his ills.

BE suspicious of any figures you hear, and of most of those you see. If they don't correspond immediately to your previous experience, check 'em before you quote or use 'em. The urge to make numbers bigger, or smaller than anything previously reported is overpowering to some people; don't be victimized.

How you can cut costs with . . .

CONTOUR TURNING

24 pages

25 cents a copy

Tracer-controlled machines are now a major factor in production turning. Today's required accuracy can be planned into the setup and dimensions can be duplicated piece after piece.

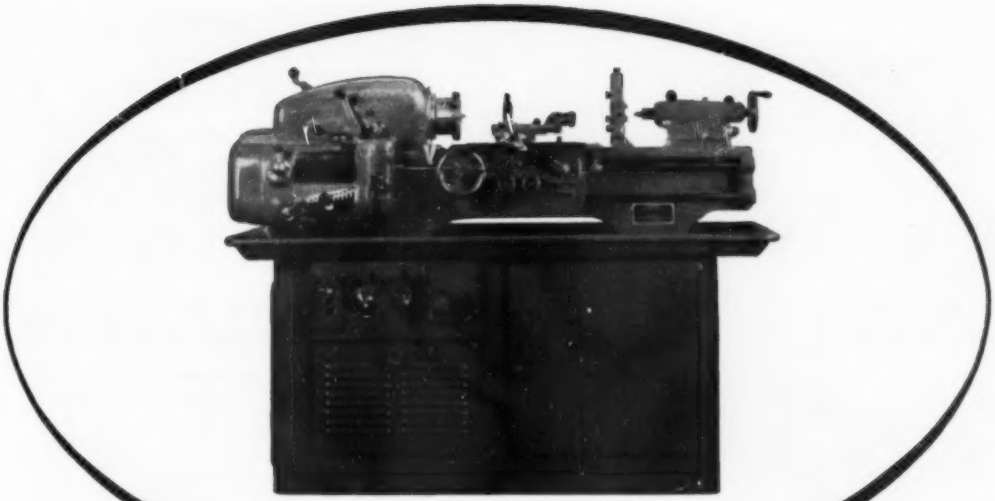
Contour turning greatly reduces manual operations, scrap is virtually eliminated, and tooling often is considerably simplified. Small lots are entirely practical, and the machines are not difficult to set up or to operate.

This *American Machinist* Special Report provides you with an overall picture of modern tracer-controlled turning. It describes basic tracing systems and how they operate . . . their limitations . . . standard practices in tooling . . . and job planning. Numerous job studies are also included to indicate the range and flexibility of tracer-controlled operation.

Write for an editorial reprint order form, listing titles and costs of other informative Special Reports.

Reader Service Department

American Machinist McGraw-Hill Building, New York 36, N. Y.

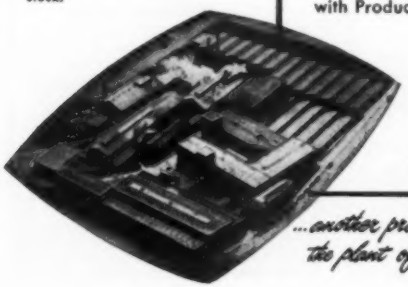


MODERN Hendey

9" x 24" TOOL AND GAGE-MAKERS' LATHE

FEATURES:

- ★ Designed and made throughout for PRECISION.
- ★ Hardened and precision ground bed ways.
- ★ Sixty-six thread cutting and feed changes without gear change.
- ★ All spindle speeds are stepless, 25 to 2000 R.P.M. forward and reverse.
- ★ Choice of M. G. Variable Speed or new Hendey Electronic drive.
- ★ Spindle runs in preloaded, super-precision, anti-friction bearings, both ends.
- ★ Super-precision lead screw.
- ★ Safety features preventing simultaneous engagements of belt feed with gear feed, and lead screw with rack feed.
- ★ Separate feed rod (independent of lead screw).
- ★ Special clamping device for tailstock.



FEATURING HARDENED & PRECISION GROUND BED WAYS

The Hendey 9" x 24" Tool and Gage-Makers' Lathe is a high-speed precision lathe — designed to satisfy the universal demand of expert tool and gage makers for a precision lathe of heavier design and greater adaptability. It has a swing over the ways of 10¼" and over the cross slide of 5⅛". Maximum capacity of spring collets is 1⅛". A choice of the M. G. Variable Speed Drive or the new Hendey Electronic Drive is available. This tool and gage-makers' lathe will perform all operations within its scope most accurately and efficiently — it will save time and money, and eliminate spoilage of work chargeable to inaccuracy, insensitivity or incapacity of lathe equipment.

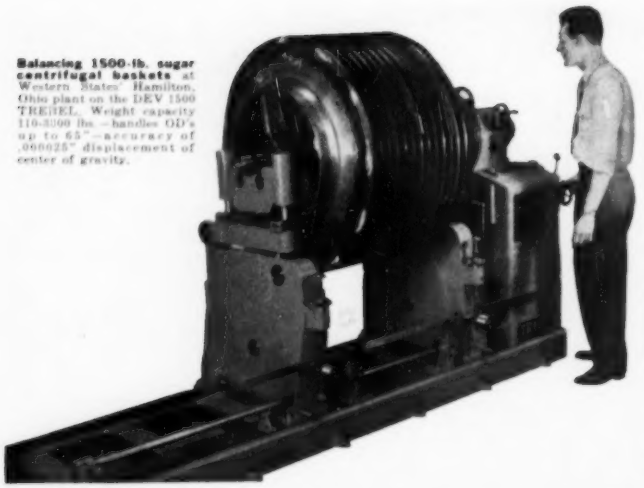
Hendey is especially qualified to manufacture such a lathe, because, for more than 70 years it has made lathes which have proved its claim of "Prestige with Production."

Write for free illustrative catalog on the Hendey 9" x 24" Lathe

the hendey machine company

...another product from the plant of precision!

MAIN OFFICE & PLANT: TORRINGTON, CONN.
BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh



Balancing 1500-lb. sugar centrifugal baskets at Western States' Hamilton, Ohio plant on the DEV 1500 TREBEL. Weight capacity 110-3300 lbs.—handles OD's up to 65"—accuracy of .000025" displacement of center of gravity.

"40% increase in balancing output" at Western States Machine Co.

- **Installation completed in a day.**
- **Operators trained—in production and maintenance—in day and a half.**
- **Balancing output went up 40% on 1500-lb. sugar centrifugal baskets—60% on smaller units!**
- **Know any other dynamic balancing machine that will give such results—so fast?**

The unique TREBEL balancing principle uses mechanical counter vibration to counteract unbalance... force is variable as to magnitude and phase and cancels out unbalance vibration in machine... indications given in ounce-inches on any work piece without further calibration... no special skills required to get fast, accurate results. Hundreds of installations in automotive, aircraft and other mass-production plants—here and abroad—prove it. Prompt delivery. Write for details.

See the TREBEL in operation in New York, Detroit or our Cleveland Service Center.

KURT ORBAN COMPANY, INC.

205 East 42nd St., New York 17 • 4200 Prospect Ave., Cleveland 3 • 19450 James Couzens Highway, Detroit 35

Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Canada

GOT A PROBLEM?

You should use Chicago "Safety Plus" Screws in Standard Listed Sizes.

• Socket Screws • Cap and Set Screws • Nuts • Taper Pins • Studs

They fasten products more securely, give a tighter hold for a neater appearance, and our three quarters of a century of experience in making fine threaded products guarantees a consistently more uniform accuracy to create sharper, smoother threads for a quicker, easier fit. They save money, too, because fewer screws and a faster fit means LOWER COSTS all down the line. Call the INDUSTRIAL SUPPLY DISTRIBUTOR nearest you today. Ask him for Chicago and get "Safety Plus".

the Chicago **SCREW COMPANY**
2805 WASHINGTON BLVD.
BELLWOOD, ILL.

Huge Expansion Now Opens a New Source of Supply for

CASTINGS

• NON-FERROUS

• GRAY IRON

• PERMANENT MOLD

You'll want to investigate the advantages of having your castings made by this huge foundry. Latest overhead equipment throughout! Over 10 tons of non-ferrous & over 150 tons of gray iron poured daily. Latest USAF approved heat treating ovens. Broaching and machining in our own shop. All alloys, including 40E, available.

WIRE OR PHONE FOR IMMEDIATE CONSULTATION — DEP'T D.

BUFFALO PIPE & FOUNDRY CORP.

Box 55, Sta. B — DE. 6763 — Buffalo, N. Y.

From the *American Machinist* Library of *Tips for Top Shop Men*

YOUR manufacturing engineers should have just one job: to make your present methods obsolete. The more they succeed, the greater is your productivity.

AN invisible boss presides over every collective bargaining session. He is not labor, management, or government—but is the customer, who exercises power of selection over your company's products.

TWO of management's most important words are "know" and "no." If you're strong on the first, you seldom hear the second.

another tough job done better with Verson equipment

THIS Verson TOOL-UP breaks round corner square billets for 90, 105 and 120 mm. projectiles

In this Verson engineered tool-up a 500 ton Verson press and a Verson billet breaking die breaks 3, 3½ and 4 inch round corner square billets preparatory to the forging of 90, 105 and 120 mm. projectiles. The tool-up is automatic—the proper length of stock is fed into the press pneumatically; each press stroke breaks a billet and the broken piece drops into a conveyor to be moved to the next stage in a fully automatic Verson shell line.

Here is another example of how know-how combined with imagination can boost production and cut costs on vital defense work. You can put this experience to work on your stamping and forging problems, too. Write or phone.

Close-ups of the Verson billet breaking die. The upper view is from the rear of the press, the lower view from the front.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

9316 South Kenwood Avenue, Chicago 19, Illinois — So. Lamar at Ledbetter Dr., Dallas, Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING
DIE CUSHIONS • COMPRESSION AND TRANSFER MOLDING PRESSES

HYDRATROL LATHES

LARGE HOLLOW SPINDLE TYPE

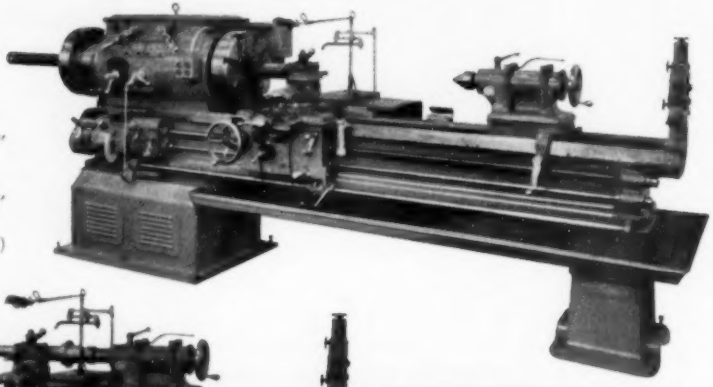
Check These 3 Points of... versatility

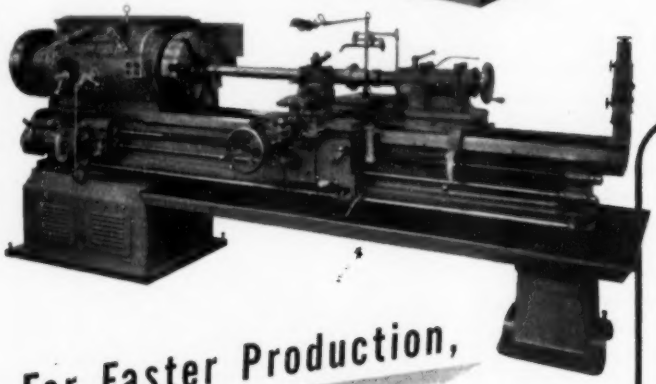
1. Machine long work chucked through spindle.
2. Machine work between centers.
3. Also built with beds and carriages on each end of headstock for machining both ends of a shaft at one time.

Both Illustrations Show the 18" Hollow Spindle 7⅛" Hole

SIZES 18" TO 36"

Small — 18" & 20" up to 7⅛" Hole
Medium — 25" up to 12" Hole
Large — 32" & 36" up to 16⅛" Hole
(Standard Type Lathes 16"-36")





For Faster Production, Better Work, Lower Costs!

IMPORTANT FEATURES

Timken Bearing Spindles.

Hydraulic clutches for forward and reverse, controlled from apron or headstock.

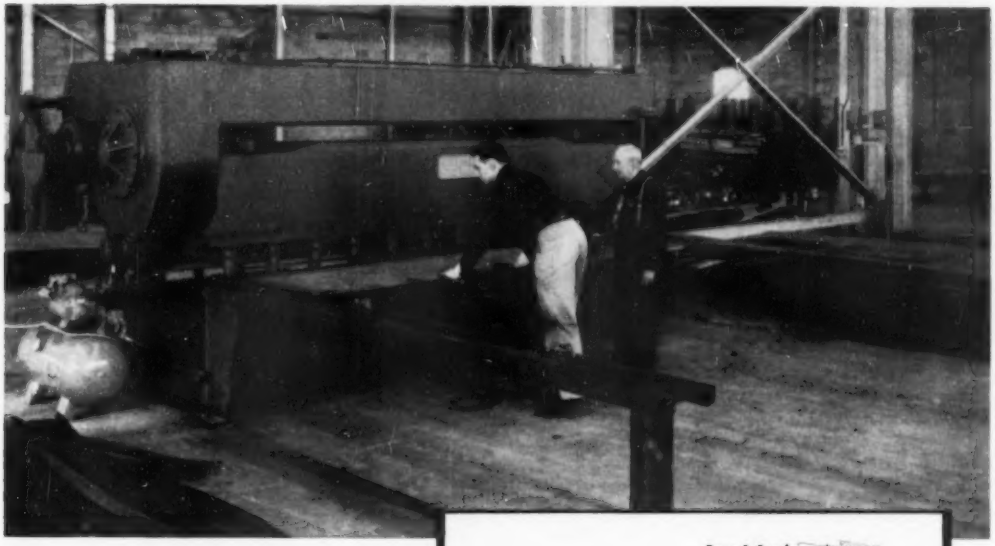
Hydraulic brake for close position control.

Hydraulic clutches self-compensating. No adjustment and full power capacity at all times.

LEHMANN MACHINE COMPANY

CHOUTEAU AT GRAND • SAINT LOUIS 3, MISSOURI

Series No. 4B12 Steelweld Shear. With more than a half century of experience in steel warehousing, Enos & Sanderson know what good shearing is. They are proud of this machine. They advertise that: "Trained shearing teams will give you the finest edge ever cut with this Steelweld"



"NEVER SEEN A *SMOOTHER* OPERATING SHEAR"

Steel Warehouse Elated with Steelweld Shear

For 57 years The Enos & Sanderson Company, Buffalo, N. Y. has been supplying steel sheets and plates to hundreds of Niagara Frontier factories. Recently they installed a Steelweld Shear in their new warehouse. This is used for cutting various thicknesses to 1/4" x 12', as per customer orders. Cuts must be smooth, straight and accurate. Speed is essential to provide best service possible.

Enos & Sanderson's new 35,000 sq. ft. steel warehouse

The following paragraph in an unsolicited letter from Enos & Sanderson indicates how well their Steelweld Shear is serving their needs:

"We are extremely satisfied with the operation of this unit and would recommend this machine highly to anyone. A rigger, who set up this shear for operation, remarked that, in his twenty-five years of work with shears of all types, he had never seen a smoother operating shear in his experience."

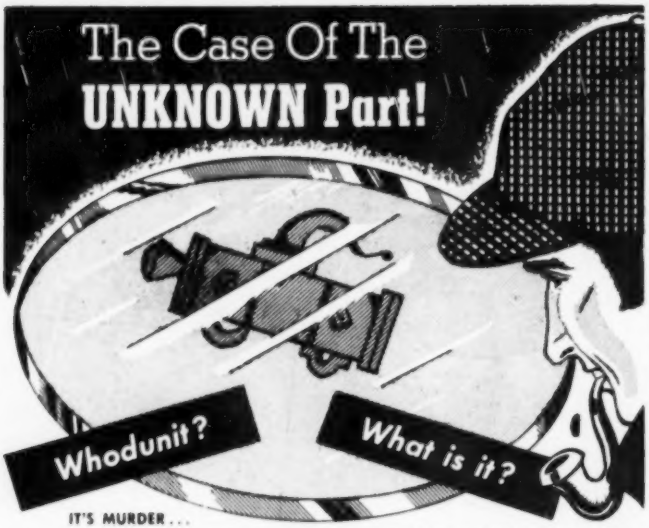
GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
1435 EAST 282nd STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

The Case Of The UNKNOWN Part!



IT'S MURDER . . .

. . . for your customers to try to reorder metal parts which aren't properly marked.

And it blackjacks your production, too, when your components can't be identified *instantly*.

SOLVE THE MYSTERY—
Mark 'Em for Profit . . .

. . . with impressions that help you in a hundred ways! Your name, model number, part number, operating instructions, decorative designs and other information can be ROLLED legibly and *permanently* into all of your metal products. It's quick, easy and *profitable!*

FREE MARKING ADVICE

Simply send prints or samples of parts to be marked, together with exact lettering and its location, for free recommendations.

WRITE FOR FREE CATALOG . . .

. . . It will help you choose the marking equipment—from hand stamps to marking machines—that will suit your *exact* needs.

CASE CLOSED By

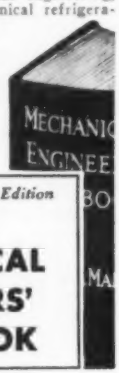
If It's Worth Making—It's Worth Marking. If It's Worth Marking—Mark It Well.

GEO. T. SCHMIDT, INC.
1810 Belle Plaine Avenue
Chicago 13, Illinois

IF YOU WERE LIMITED TO ONE ENGINEERING BOOK

the 5th Edition of MARKS' would give you the greatest value and satisfaction as that book.

Complicated problems disappear as easily as routine questions of design and practice when you consult this new outstanding engineers' guide. Check your methods against today's best accepted practice, as reflected in the 16 *completely revised and modernized* sections of Marks' Handbook. It covers every branch of mechanical engineering, from aeronautics to mechanical refrigeration, from power generation to welding, from metal-cutting machines to hoisting and conveying—*providing answers to thousands of questions of every type.*



Completely Revised 5th Edition
MARKS'
MECHANICAL ENGINEERS' HANDBOOK

Edited by
LIONEL S. MARKS
Gordon McKay Prof. of Mech. Engr., Emeritus, Harvard University

5th Edition, 2236 pages, 6 x 9, approximately 2000 illustrations, $15.00

- New 6 x 9 page size (formerly 4½ x 7) permits an increase of about 10% in the text without increasing the number of pages, and a larger type size to assure you of good legibility. The book's illustrations and graphs have been similarly enlarged.
- The index, more detailed than ever before, contains over 12,000 entries in this edition, and again is one of the fullest and most useful to be found in technical books.
- Over 100 contributors, each a specialist in his field, bring you up to date with recent advances made in mechanical engineering *theory, processes, materials, and power.*
- 2236 pages of descriptions, data, and diagrams help you solve today's problems of design and practice.

10 DAYS' TRIAL — EASY TERMS

McGRAW-HILL BOOK CO., Inc.
330 W. 42nd St., New York 36

Send me Marks' MECHANICAL ENGINEERS' HANDBOOK, 5th Edition, for 10 days' examination on approval. In 10 days I will remit $2.00, plus few cents for delivery, and $2.00 monthly until $15 is paid, or return book postpaid.

(PRINT)
Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position FA-11-10-52

This offer applies to U. S. only.

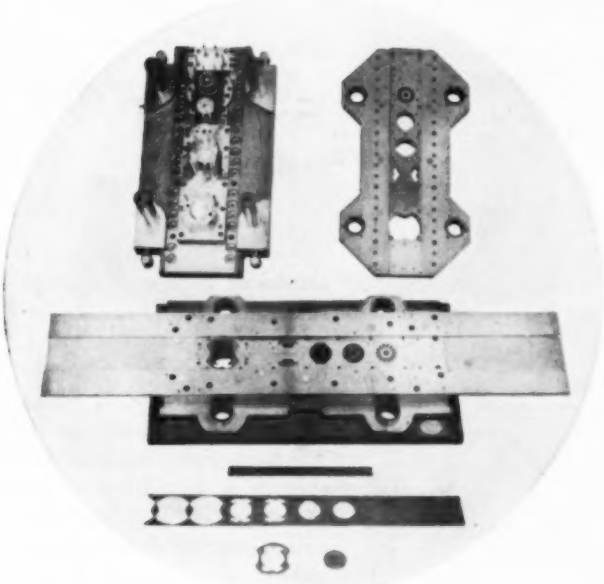
DID YOU KNOW

. . . that you will find more advertising for machine tools in *American Machinist* than appears in any other magazine in the world?

All of it will guide you to the best in modern machining methods and equipment. You spend time well when you spend it in the pages of *American Machinist*.

This die was not just "made"...

it was ENGINEERED



Just a choice of words, you say? No, it's more than that. The progressive steel lamination die shown here was hole-bored, hole-ground and contour-ground to pre-engineered dimensions entirely on Moore-built machines in the Moore toolroom. It exemplifies the application of *engineering* principles that put die-making on an interchangeable parts-and-assembly basis for the first time.

Let's take a close look at this die: All die sections are mounted in a hardened nickel-chrome frame for maximum production and die life; the die set was specially made by Moore. The spring stripper is guided on four main posts. High-speed inserts are set into hardened steel frames.

Moore produced all parts of the die *to figures instead of to "fit."* This was done concurrently by several toolmakers instead of progressively as a slow, one-man job.

Precision Hole Location and Contour Grinding Methods Assure Accuracy, Speed, Economy

THE NO. 2 MOORE JIG BORER bored all holes before hardening, thus holding the location as close as possible to eliminate excessive grinding. With its built-in system of accurate lead screws, the Moore Jig Borer can spot, drill, bore or ream all holes in a workpiece with minimum tool changes and to close tolerances.

No. 2 MOORE JIG BORER

Punches and dies of the first station—at the right in the photograph—were ground with a *Moore Panto-Crush Wheel Dresser*. This machine, which combines roll-crushing and diamond dressing, did the required linear contour grinding quickly and efficiently. *Moore Motorized Centers* handled several of the smaller grinding jobs.

WITH THE NO. 2 MOORE JIG GRINDER, all die sections were screwed and doweled into place, put on the machine and ground in *one* set-up. This eliminated separate section hole-grinding and the accompanying difficulty of accurately locating each section in the die bed. The Jig Grinder does the job in one-third the time required by previous methods.

To grind Stations 2, 3, 4, 5 and 6, the new contour-grinding and slot-grinding features of the Jig Grinder were utilized.

Die try-out and assembly operations were performed the modern, fast, "mechanized" way on the *Moore Die Flipper*.

No. 2 MOORE JIG GRINDER

End results? Moore equipment brings true interchangeability to the toolroom, lowers tool costs, increases toolroom capacity, prolongs die life and achieves greater accuracy.

Detailed bulletins on these machines are yours for the asking—today. Write to: Moore Special Tool Company, Inc., 738 Union Avenue, Bridgeport 7, Conn.

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS
DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

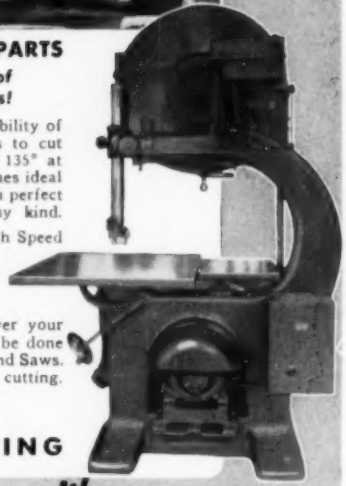
The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.



Write for Your Free Copy

FRICTION SAWING

***with* Tannewitz**

HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

Have you heard ? about

THE LUBRICANT OF MANY USES

Moly-sulfide

A LITTLE DOES A LOT

In the shop—

In the field

Moly-sulfide **is a solid-film lubricant, highly successful in applications involving extreme pressures, high velocity, fretting, elevated temperatures and other difficult frictional conditions. We have compiled detailed records of 154 different applications of molybdenum sulfide to actual shop and field problems—some of which might be similar to your own.**

Shopmen, engineers, lubrication specialists—write now for a copy of this new 40-page booklet.

Climax Molybdenum Company

500 Fifth Avenue

New York City 36 N.Y.

Please send me your Free Booklet

Name.....

Position.....

Company.....

Address.....

MOLY

AM-11 MS4-A

for SMALL JIG BORING

PUT SMALL JOBS ON THIS LINLEY MACHINE

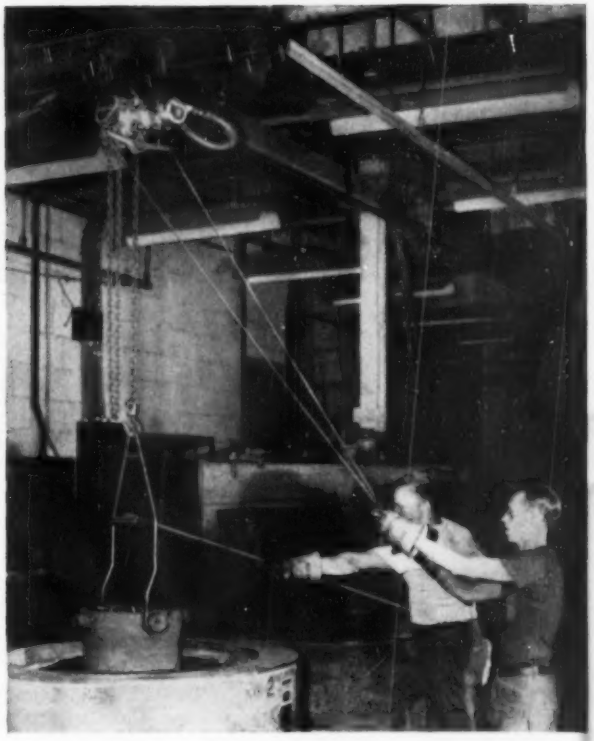
and save your larger machines for heavier work.

YOU'LL BE SURPRISED! at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7" x 17½" table size.

Write TODAY for Full Information

LINLEY BROTHERS COMPANY

664 STATE ST. EXT., BRIDGEPORT 1, CONN.



LIFTS 1000 POUNDS
at 20 feet a minute

. . . or 500 pounds at 42 feet a minute

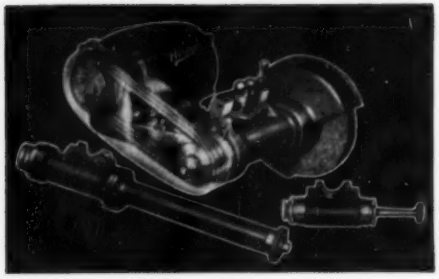
- This latest CP AIR HOIST — with variable speed, rotary vane air motor — spots loads accurately, quickly; sets them down gently.
- New design, trouble-free throttle valve provides sensitive control from an almost imperceptible creep to full speed.
- Air motor cannot overheat — no shock hazard — no spark hazard — no switches to maintain.
- Self-locking worm gear provides automatic brake — no brake bands to adjust or replace.
- Weighing only 57 pounds, the CP AIR HOIST can readily be carried by millwright to any location.
- Furnished in 300, 500, 700, and 1000 pound capacities.

Write for a copy of Bulletin SP-3027

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

Fiftieth ANNIVERSARY

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



YOUR LATHE
is a precision Grinder!

Either internal or external—your boring mill, too—and planer and other machine tools in your shop, are now capable of precision grinding of rolls, surface plates, bearings, journals, mandrels, cutters, etc. They merely require a HISEY Wide Range Precision Grinder attached to their regular tool holding fixture.

Built in a number of sizes and types, they are adaptable for production work as well as the thousand and one odd grinding jobs which crop up in every shop and tool room.

The V-Belt drive affords the most efficient and economical speed and permits rapid speed changes as required.

Driven by constant speed motor, a steady, uniform speed is maintained as required for best results.

Catalog 72-AE on Request

Hisey THE HISEY-WOLF MACHINE CO.
CINCINNATI 8, OHIO

QUICK SOLUTIONS
TO TOUGH-TOOL DESIGN PROBLEMS
. . . are thoroughly discussed

in *American Machinist's* Special Report, "Calculating Form Tools." Write to Reader Service Department, *American Machinist*, 330 W. 42nd Street, New York 36, N. Y.

How to Work Clad Materials

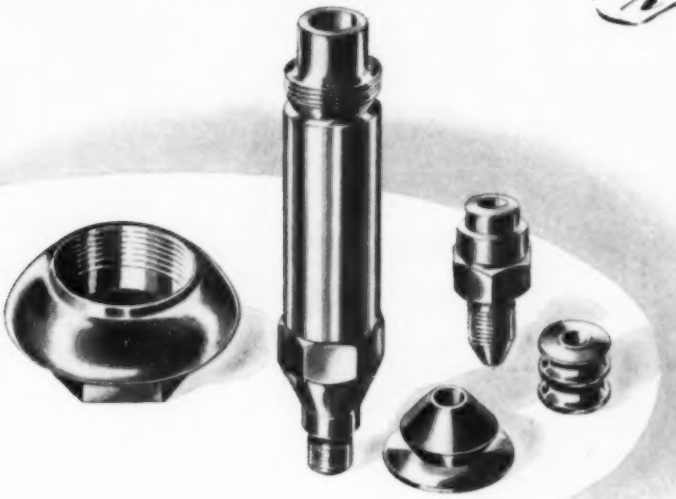
Proper application of clad materials can cut costs and save scarce metal. Output of clad materials has more than doubled since 1946 . . . has climbed to more than 23,000 tons per year and may reach 1,000,000 tons by 1960. Clad materials offer advantages that may well have profit-wise applications in your business.

Clad materials are not difficult to work, require only care and routine experience. "How to Work Clad Materials," an *American Machinist* Special Editorial Report, contains all the latest facts on how to work clad materials most efficiently and profitably. This 16-page report, complete with informative drawings, diagrams, and photographs, is still available for only 25¢ a copy. Write to Reader Service Department:

American Machinist
McGraw-Hill Building
New York 36, N. Y.

Look at that smooth finish . . .

it's CHASE® Free-Cutting Brass



Parts machined from Chase free-cutting brass, copper and bronze have a smooth, clean finish, free from rough edges. That means they're considerably less expensive to lacquer, enamel or plate. And because of their high strength and hardness, they will stand up under extensive handling and reuse. You'll get better quality production at lower unit costs when you use Chase free-cutting brass, copper and bronze. Fill in and send coupon below for free 56-page Chase book.

Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(†sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

FREE Chase book discusses advantages, gives weights, properties and tolerances of Chase free-cutting brass, copper, bronze.

Chase Brass & Copper Co., Dept. AM 1152
Waterbury 20, Conn.

Please send me free book "Chase Free-Cutting Brass, Bronze, Copper."

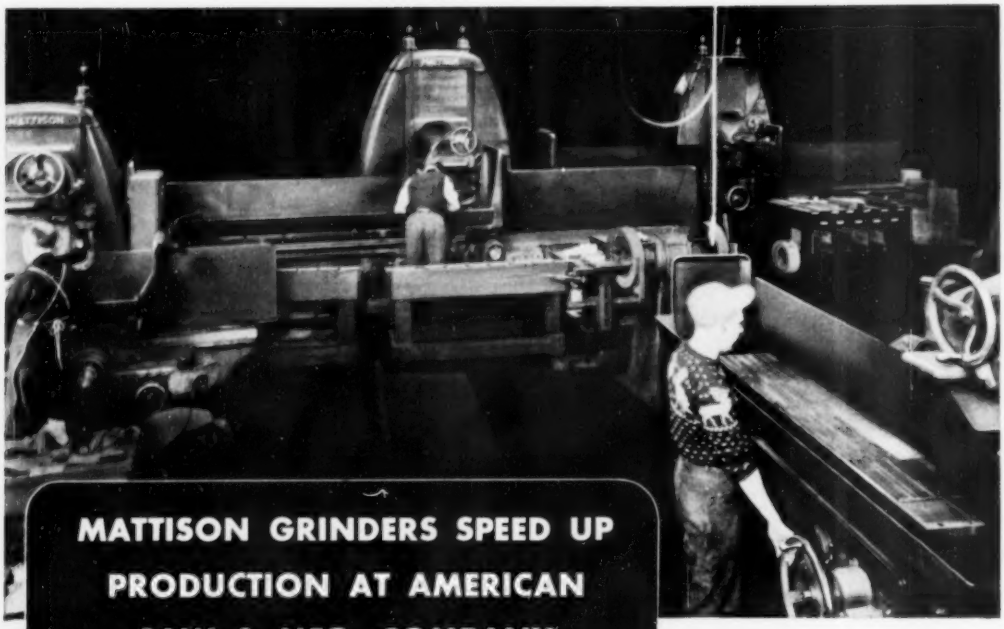
Name_____

Position_____

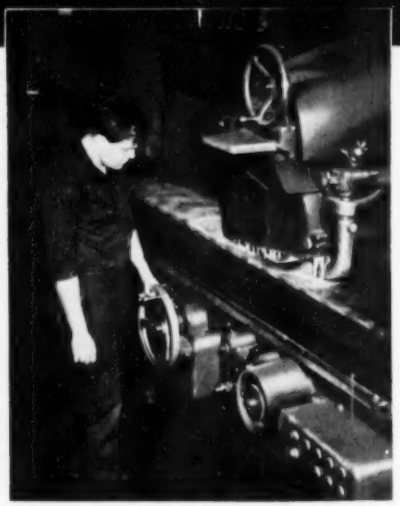
Firm_____

Address_____

City_____ State_____



MATTISON GRINDERS SPEED UP PRODUCTION AT AMERICAN SAW & MFG. COMPANY



● The four Mattison High Powered Precision Surface Grinders shown above are used by American Saw & Mfg. Company for the grinding of annealed tool steel strips and bars on a real production basis in the manufacture of Lenox Precision-Master Ground Flat Stock. Exacting manufacturing specifications demand excellent finishes within close limits of accuracy.

The massive double column support, high power and rigidity of construction of the Mattison Grinder combine with accuracy and speed of operation to insure consistent precision results on a high production basis for American Saw & Mfg. Company. For complete information regarding the capabilities of the Mattison High Powered Precision Surface Grinder send for free circular.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

Specify

PEERLESS HIGH SPEED EXPANSION REAMERS

...For
ECONOMY
LONG LIFE
BETTER FINISH
GREATER ACCURACY

When the reamer becomes dull, it may be put back into its original serviceable condition not once, but many times, by expanding and resharpening.

Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 7 • Chicago 6 • Dallas 7 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

Here's the Big Difference!

TAPER-LOCK

-The Sheave that always runs true!

The Taper-Lock bushing seats evenly along the entire length of the hub. It is self-seating. There is no collar—no protruding part—no flange to prevent uniform compression.

With full contact, Taper-Lock sheaves run true. Made of finest grade of close-grained semi-steel, cast in the Dodge foundry. Precision grooves have identical pitch diameters so that every belt can pull its share of the load.

Sheave and bushing mount as a unit—easy to align on the shaft. Grips the shaft like a shrunk-on fit. Flush hub means safety.

THERE IS ONLY ONE TAPER-LOCK (a patented product of Dodge). Available from distributors' stocks in a complete range of sizes in A-B combination, B, C and D grooves. Also ask your distributors for Dodge Sealed-Life V-Belts. WRITE for complete data.

DODGE MANUFACTURING CORPORATION, 100 Union St., Mishawaka, Indiana

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER

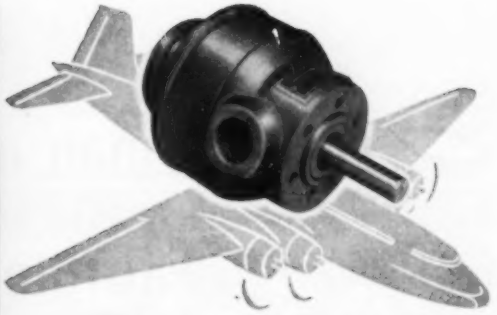
your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified phone book.

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

you get the

finest the fastest

when you specify



Series "QH" Hydraulic Pumps . . . 4 sizes, for continuous pressures up to 1200 p. s. i., intermittent to 1500. Deliveries from 3 to 12 g.p.m. at 1200 r.p.m.

Series "B" Hydraulic Pumps . . . 3 sizes, for continuous pressures up to 1000 p. s. i. Deliveries from .4 to 1.5 g.p.m. at 1800 r.p.m.

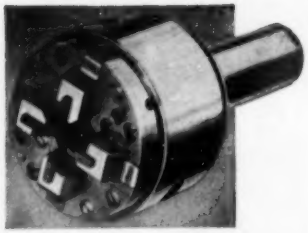
Series "O" Hydraulic Pumps . . . 4 sizes, for continuous pressures up to 1000 p. s. i. Deliveries from 20 to 40 g.p.m. at 1200 r.p.m.

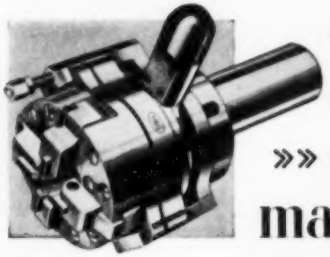
GEROTOR

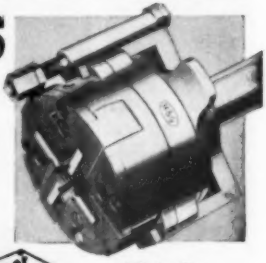
hydraulic pumps

GEROTOR MAY CORP., Baltimore 3, Md.

An IDLE man at a BUSY automatic spells profits »» a BUSY man at an IDLE machine spells LOSS







H & G INSERT CHASER DIE HEADS
ARE PREFERRED BY SCREW MACHINE ENGINEERS
BECAUSE THEY SPELL . . . LESS DOWNTIME . . .
BETTER THREADS . . . LOWER COSTS

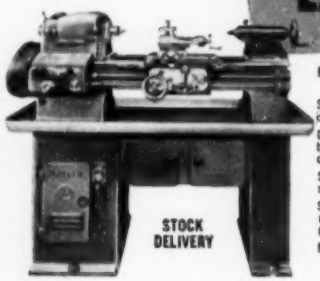
H&G Insert Chaser DIE HEADS

Write for informative literature

THE EASTERN MACHINE SCREW CORPORATION
20-40 Barclay Street, New Haven, Conn.

ACCURATE AND DEPENDABLE!

SIMPLEX ENGINE LATHES



PARTIAL SPECIFICATIONS	10"	13¾"
Swing over bed:	10¼"	13¾"
Distance between centers:	19⅝", 31½"	30", 40", 60"
Spindle speeds:	16	12
Speed range (RPM):	50-1600	47½-900
Motor:	¾—1½ HP	2—1 HP

Years of experience and reputation in the Machine Tool field confirm the high standards of these lathes in design, materials and workmanship . . . They are rigidly constructed for high efficiency and close tolerance, and will give long-time, economical service.

The Simplex lathes come with ground lead screw, complete range of American Standard threads, quick change gear box, spline shafts, heavily constructed and well ribbed bed to guarantee minimum vibration. All measurements are in INCHES AND DECIMALS.

Write us now for complete details!

MOREY *for machine tools!*

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410 BROOME STREET • NEW YORK 13, N. Y.
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

KEYSEATING
The Modern Way

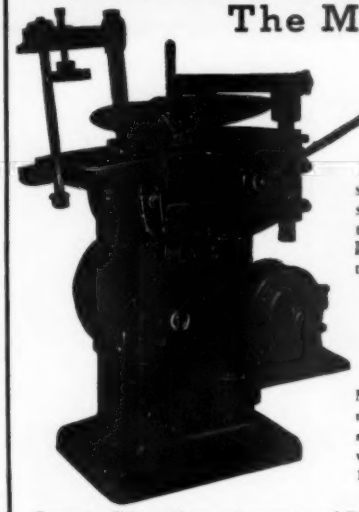


Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

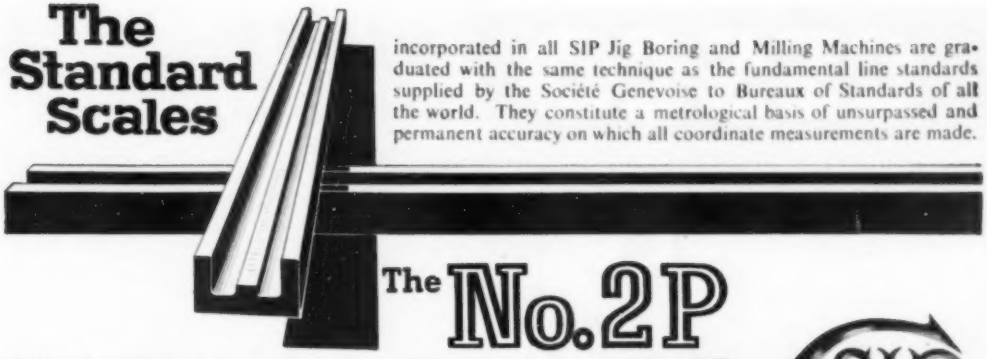
Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

The Standard Scales

incorporated in all SIP Jig Boring and Milling Machines are graduated with the same technique as the fundamental line standards supplied by the Société Genevoise to Bureaux of Standards of all the world. They constitute a metrological basis of unsurpassed and permanent accuracy on which all coordinate measurements are made.



The No. 2P

High Precision Jig Borer

comprises two standard scales at right angles to each other built into the cross-slides of the work-table. The graduations of the scales are viewed at a large magnification on

projection screens

grouped conveniently on the front of the machine and provided with adjustable setting indexes controlled by micrometer drums permitting coordinate values to be read to .0001 in.

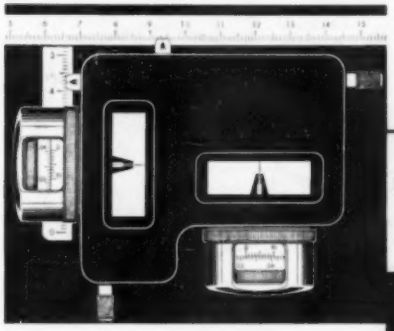
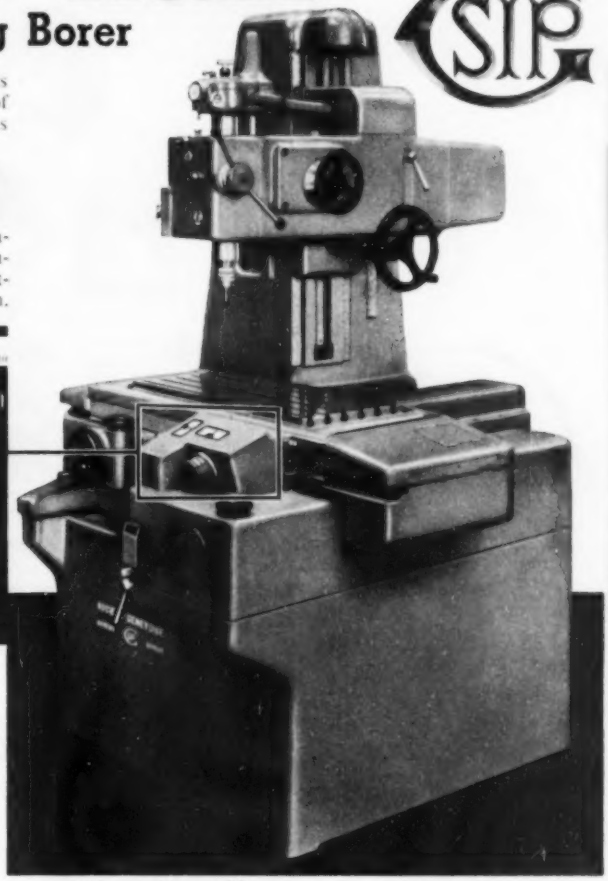


Table setting devices



SIP

SPECIFICATION

Working range	16" × 10"
Table working surface	27 1/2" × 12 1/4"
Table top to spindle end	19"
From spindle axis to column	13 3/8"
Spindle speeds	200 to 3000 rpm.
Boring capacity	1 9/16"
Spindle quill travel	5"
Net weight	3,750 lbs.

Guaranteed accuracy for all table settings: .0001 in.

REPRESENTATIVE FOR U.S.A. AND CANADA:

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS AND MEASURING EQUIPMENT

100 East 42nd Street NEW YORK 17, N.Y.

A 21

CESCO RIGHT... before your Eyes!

WHERE TO BUY IT...

ATLANTA, GA.
Guardian Safety Equipment Co.
427½ Moreland Avenue, N. E.

BIRMINGHAM, ALA.
Guardian Safety Equipment Co.
4215 1st Ave. No.

BOSTON, MASS.
General Equipment Corporation
261 Franklin Street

BUFFALO, N. Y.
The Watson Company
1443 Main Street

CHICAGO, ILL.
Universal Safety Equipment Co.
5115 Diversey

CINCINNATI, OHIO
Williams & Co., Inc.
3231 Fredonia Avenue

CLEVELAND, OHIO
Williams & Co., Inc.
3700 Perkins Avenue

COLUMBUS, OHIO
Williams & Co., Inc.
851 Williams Avenue

DETROIT, MICH.
Averill Equipment Company
19225 Conant Avenue

EAST ORANGE, N. J.
Guardian Safety Equipment Co.
491 Prospect Street

HOUSTON, TEXAS
Guardian Safety Equipment Co.
1915 A Westheimer

KANSAS CITY, MO.
Safety, Incorporated
17½ E. 31st Street

KNOXVILLE, TENN.
Safety Equipment Distributing Co.
832 W. Main Street

LITTLE ROCK, ARK.
Fire Appliance & Safety Co.
1114 W. Markham

LOS ANGELES, CALIF.
Guardian Safety Equipment Co.
6104 S. Main Street

MILWAUKEE, WIS.
Universal Safety Equipment Co.
3155 S. 7th Street

PEORIA, ILL.
Universal Safety Equipment Co.
1710 Main Street

PHILADELPHIA, PA.
Guardian Safety Equipment Co.
214 S. 45th Street

PITTSBURGH, PA.
Williams & Co., Inc.
901 Pennsylvania Avenue

ST. LOUIS, MO.
Safety, Inc.
2608 Olive Stree

ST. PAUL, MINN.
Continental Safety Equipment, Inc.
1351 Selby Ave.

SALT LAKE CITY, UTAH
Universal Fire & Safety
Equipment Co., Box 1587

SAN FRANCISCO, CALIF.
Guardian Safety Equipment Co.
50 Hawthorne Street

SPOKANE, WASH.
Spokane Safety Appliances
W. 310 Pacific Ave.

TOLEDO, OHIO
Williams & Co., Inc.
650 E. Woodruff Avenue

TULSA, OKLA.
Guardian Safety Equipment Co.
1742 S. Main Street

MEXICO CITY, D. F.
Safety Equipment S. A.
Paso de la Reforma 1-856

MONTREAL, CANADA
The Butler Optical Company, Ltd.
1520 Mountain Street

CHICAGO EYE SHIELD COMPANY • 2320 Warren Boulevard, Chicago 12, Illinois

CESCO

CESCO FOR SAFETY

SCHAERER

HIGH DUTY LATHES for PROMPT DELIVERY

Built to the Highest American Standards of Accuracy, Productivity and Convenience

With the attachments available, these German-designed and built lathes represent the maximum in versatility . . . production lathes built to tool room standards, recognized universally for high precision and top performance.

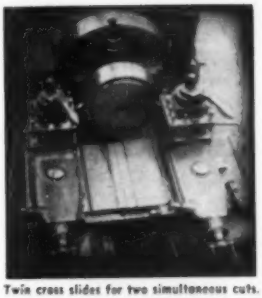
Specifically, the SCHAERER HIGH DUTY LATHE offers:

- . . . all gears in headstock hardened and ground.
- . . . front and rear main spindle bearings lubricated by separate oiling system.
- . . . main shaft motor-driven through forward and reverse multidisc clutches.
- . . . multiple-screw cutting attachment provided on headstock.
- . . . quick-change gear and carriage equipped with one-shot oiling system.
- . . . carriage automatically released by friction clutch in case of overload.
- . . . cross slide equipped with ball catch stop for accurate adjustment of depth cutting.
- . . . adjustable carriage stop provided for longitudinal turning.

Full detailed specifications are contained in illustrated brochure available promptly on request.

Come and see these lathes in operation under power. Bring samples for test purposes if you wish.

Variety of tooling combinations available.



Twin cross slides for two simultaneous cuts.

Condensed Specifications

18" to 20" swing available.
20" to 22" swing over gap.
Distance between centers from 20" to 120".

Hydraulic Copying Attachment with twin cross slides for facing work and turning between centers.

M. B. I. EXPORT & IMPORT LTD.

475 GRAND CONCOURSE — MBI — BRONX 51, NEW YORK

Designed for high speed precision work...

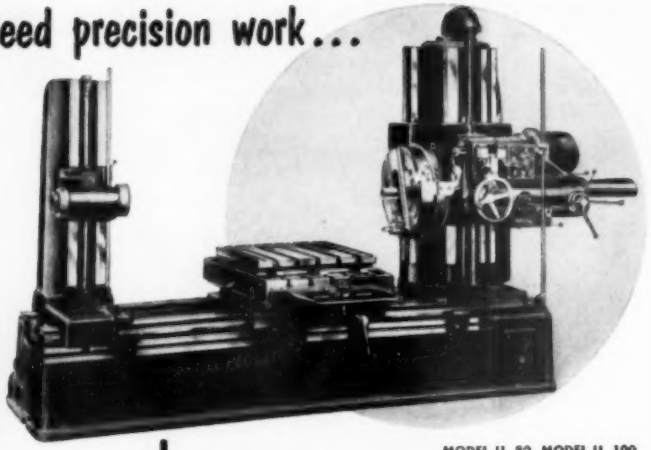
PEGARD

HORIZONTAL BORING MILLS

Built with extreme accuracy, these fine boring mills have extra features that insure economical operation and high quality work!

- ***Precise reading of co-ordinates—with an accuracy of .0005".***
- ***High cutting speeds—ideal for tungsten carbide, titanite or diamond tipped tools.***
- ***Ease of operation — with unproductive time greatly reduced.***
- ***Rigid construction — maintaining initial precision for many years.***
- ***Safety — luminous movement control board eliminates faults.***

PROMPT DELIVERY NO PRIORITY



PARTIAL SPECIFICATIONS

	MODEL U. 80	MODEL U. 100
Spindle diameter	3 5/32"	3 15/16"
Spindle traverse	31 15/32"	39 3/8"
Spindle speeds	18	18
Facinghead speeds	6	9
Long. traverse of table	51 3/16"	63"
Motor	7 HP	13½

Write today for full details and specifications.

MOREY ...for machine tools!

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410 BROOME ST. • NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-7400
CABLE ADDRESS: WOODWORK, N. Y.

WILLEY'S TUNGSTEN CARBIDE TOOLS

Willey's—The COMPLETE LINE of cutting tools—made complete in our own factories. Hundreds of standard sizes always in stock.

Excellent service on special tools built to your specifications.

Send us your prints. You will receive prompt acknowledgement, quotation and delivery date.

CATALOG

Mailed on request. Please use your business letterhead.

WILLEY'S CARBIDE TOOL CO.
1342 W. Vernor Highway — Detroit 1, Michigan

How To Mark Name Plates In 1/5 the Time

Cutting costs in these times is a good trick if you can do it. You can, on plates requiring detail marking, by using an Automark Electric Metal-Marking Typewriter. The operator lightly touches the key and the Automark does the rest, quickly and automatically. No dial to turn—no lever to pull. Marking output is increased five times and worker fatigue is greatly reduced. Write today for Bulletin 8-16.

AUTOMARK
Electric Metal-Marking
TYPEWRITER
Manufactured Exclusively By

AGENTS
Desirable territories open for responsible representatives. Write giving complete information, lines carried and territory covered.

DEFIANCE MACHINE & TOOL COMPANY
1920 South Vandeventer Ave. • St. Louis 10, Mo.

The G-12

GONIOMETER-COLLIMATOR

. . . quick reading

. . . measures angles to 15 secs./arc

. . . repeats settings to 5-10 secs./arc

. . . head reversible for use on surface plates

. . . removable for setting production machines as shown.

. . . furnished with adjustable vernier so zero can be set for any reference surface.

A TRULY VERSATILE INSTRUMENT FOR A WIDE VARIETY OF APPLICATIONS

Used for setting and checking FLATNESS—PARALLELISM . . . SQUARENESS . . . SMALL and LARGE ANGLES . . . INTERNAL and EXTERNAL TAPERS . . . VALVE SEATS . . . VERTICAL MILLING MACHINES . . . LATHES . . . GRINDING MACHINES . . . BORERS, etc.

A MUST for the well-equipped machine shop.
Send for manual covering typical applications.

SAFE FLIGHT INSTRUMENT CORPORATION

Optical Division

4 WATER STREET, WHITE PLAINS, N.Y.

Whiton

UNIVERSAL LATHE CHUCKS

THIS WHITON EXCLUSIVE ASSURES LONGER LIFE

DOUBLE-BUSHED

Renewable hardened bushings at either end of pinions give long wearability and stabilize pinion end play.

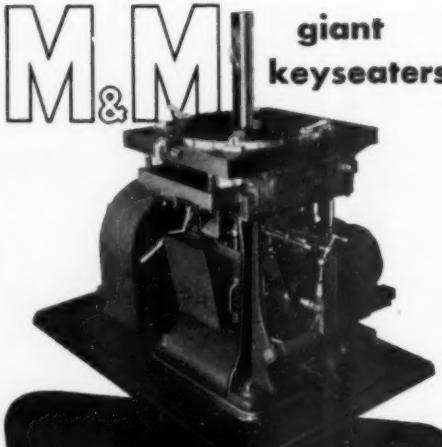
Rigid individual process inspection and exhaustive tests after assembly guarantee chuck users the best in work holding.

If you have a work holding problem . . . WRITE WHITON. Ask for catalog.

Makers of Fine Chucks · Steam Turbine · Centering Machines ·

THE WHITON MACHINE COMPANY
NEW LONDON, CONN.

M&M giant keyseaters



M & M Giant Keyseaters, built in a range of sizes, speedily and accurately cut internal keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems.

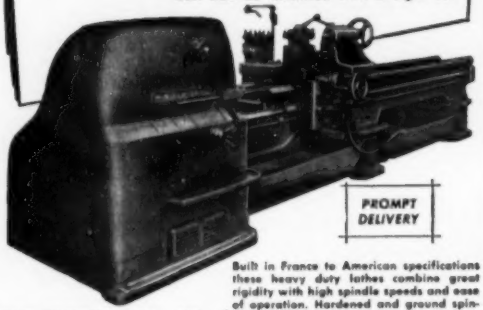
MITTS & MERRILL
104 Holden Street • SAGINAW, MICHIGAN

Complete Accuracy with Simplicity of Control

NEW! PEGARD

PRECISION HEAVY DUTY GEARED HEAD GAP LATHES

Can also be furnished with straight bed



PROMPT DELIVERY

PARTIAL SPECIFICATIONS	P-500	P-600
Distance between centers	40"	40"
Swing over bed	23⅝"	27⅛"
Swing over carriage	11⅞"	15⅛"
Swing in gap	33½"	37½"
Diameter of spindle	3¼"	3¼"
Hole in spindle	2-3.16"	2-3.16"
Spindle speeds (12)	6-1000 rpm	6-1000 rpm
Motor	12-15 HP	12-15 HP

Write today for brochure

Built in France to American specifications these heavy duty lathes combine great rigidity with high spindle speeds and ease of operation. Hardened and ground spindles are mounted in tapered, easily adjusted roller bearings while the well-ribbed tailstock is equipped with vernier scale for drilling.

The design allows the full use of carbide tipped tools. A special, recently developed electrical system is incorporated to give immediate braking of the spindle at any revolving speed without mechanical risk or electric overload.

Sales territories open

MOREY for machine tools!

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
418 BROOME STREET • NEW YORK 13, N. Y.
CANAL 6-7400 • CABLE ADDRESS: WOODWORK, N. Y.

Precision power presses and feeds in a wide range of types and sizes to meet every requirement.

See Pages 70-71
October 27th, American Machinist

THE V & O PRESS CO Division of Emhart Mfg. Co. HUDSON, N. Y.

HIGH SPEED CARBIDE

Severance

MIDGET MILLS · CHATTERLESS COUNTERSINKS

SPECIAL CUTTERS — REGRINDING SERVICE

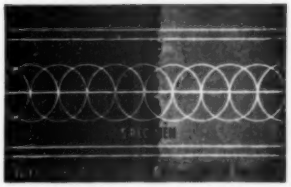
Ask for our general catalog

Severance Tool Industries, Inc.

726 Iowa Ave., Saginaw, Mich.

DYKEM STEEL BLUE

STOPS LOSSES making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.

"What would you have done?" asks Mr. George Fehlman

Executive Vice-President, Belnap & Thompson, Inc., Chicago—merchandise prize incentive programs

"Recently, we had to deliver prize material to client sales meetings, scheduled all over the country for the same day.

"We were forbidden to ship early—and we *must* not be late! What would you have done?

"We called Air Express.

"Within 24 hours, almost 1,000 shipments were dispatched. All arrived on schedule. Not a single call or wire inquiring about a shipment was received!

"We've become accustomed to that kind of service from Air Express. What's more—on practically every shipment we make, the Air Express rate is *lowest* in the field. These rate differences often save several hundred dollars in one day's shipping!

"Our business has grown from $4½ million yearly sales 5 years ago, to more than $9 million this year. We give credit for an important 'assist' to Air Express!"

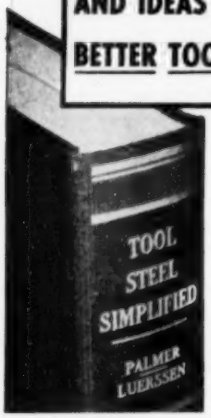
AIR EXPRESS

GETS THERE FIRST

Division of Railway Express Agency
1952 – our 25th year of service

why does one shop consistently produce good tools and dies ... while another runs into periodic trouble? ... *this book gives*

ALL INFORMATION, METHODS, AND IDEAS NEEDED TO PRODUCE BETTER TOOLS AND DIES



Practical Data on Popular Analyses of Tool Steels, their Selection, Heat Treatment, and Use

in the Revised, Enlarged SIXTEENTH PRINTING of this

TOOL and DIE STEEL HANDBOOK

By Palmer and Luerssen

Here's the BOOK OF ANSWERS for every man responsible for tools and dies. Shows you how to increase your company's production from present equipment—how to reduce toolmaking trial and error, conserve tool steel, avoid die troubles, simplify heat treatment. It starts "from the beginning" with *what* tool steels are, their analyses, and why one grade will outperform another on some jobs. Gives complete working information on everything from selection of the right steel to heat treating methods and equipment, hardness and toughness testing, latest data on high speed and hot work steels. 564 pages, 355 charts, photos, diagrams give you facts on: how design affects heat treatment, hardenability tests, time required to heat different tools to required hardening and drawing temperatures, furnace atmospheres, quenching, tempering, trouble-shooting.

INCLUDING 80-PAGE TOOL AND DIE STEEL SELECTOR

Conveniently bound right in the book and arranged alphabetically to put your finger on the one steel that will give best results. Use this book to train new men—its logical step-by-step presentation gives apprentices thorough basic training—gives skilled men, new, modern methods and techniques.

OVER 100,000 COPIES IN USE!

CLIP AND MAIL NOW

THE CARPENTER STEEL CO. • READING, PA. • DEPT. 1X-1

Please send me, postpaid, your revised "Tool Steel Simplified". I enclose $2.00 ($2.50 outside U. S. A.) in full payment of the book.

NAME _____ TITLE _____

FIRM NAME _____

MAILING ADDRESS _____

CITY _____ STATE _____

(Please Print)

CORNELIS

THREAD GENERATING MACHINE

Cuts screw threads, lead screws and worms by an improved generating method. The principle employed differs considerably from the conventional method of thread milling, lathe turning, or die chasing and will be of interest to anyone requiring work of greater accuracy and better finish, as well as higher production.

WRITE FOR ILLUSTRATED FOLDER

GEORGE SCHERR CO., Inc.

COMPLETE LINE OF PRECISION INSTRUMENTS

200 D LAFAYETTE ST. • N.Y. 12, N.Y.

LUERS Patented Cutting Off Tool Holders, Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips MEANS MAXIMUM CUTTING EFFICIENCY

Manufactured By

J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

choose

FERRACUTE INCLINABLES

Fast . . . economical . . . dependable

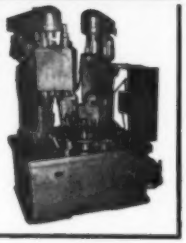
Complete line of mechanical presses. Since 1863

FERRACUTE MACHINE CO., Bridgeton, N. J.

KAUFMAN TAPPING MACHINES

BUILT FOR SPECIFIC PRODUCTION JOBS

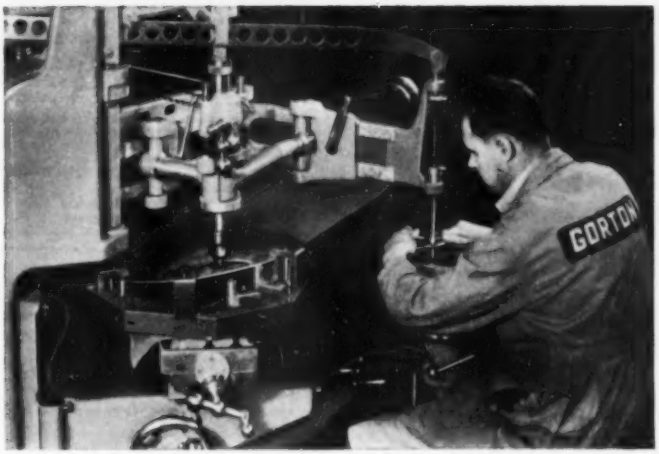
Every machine precision-built to meet the requirements of individual production jobs. Designed with fully automatic cycle, single or multiple spindle heads and other most advanced features.



Write for complete information

KAUFMAN MFG. CO.

MANITOWOC, WISCONSIN



Tracer-Controlled Pantograph cuts and rounds thermal slot in 8-foot steel propeller blade in 40 minutes; previous time was 5 hours, 10 minutes — just one of hundreds of examples of time and cost saving with tracer-controlled Pantograph machines.

Pantography IS NEW —

By George Gorton III
Executive Vice President,
George Gorton Machine Co.

— in the sense that industry at large and Metal Working people in particular are just beginning to appreciate the many advantages Pantography offers to those faced with the Design-Production problems of today and tomorrow.

INDUSTRY'S foremost responsibility right now is to produce faster, to highest quality standards and at lower cost — whether on defense contracts or for our civilian needs.

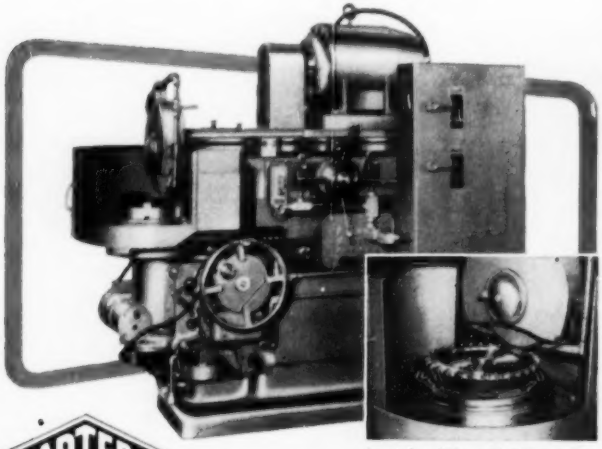
Today, there are literally thousands of operations being performed throughout industry which can be speeded up, improved in quality and lowered in cost by the use of available models of special machine tools. The modern tracer-controlled Pantograph machine is such a tool. It is both a special purpose machine, ideal for short runs, and it is an accurate single purpose machine which turns out identical parts or pieces to meet tight production schedules.

The tracer-controlled Pantograph machine is used for inside and outside profiling, routing, die sinking, mold cutting, counterboring, contour milling, chamfering, grooving, graduating and engraving in ferrous and non-ferrous metals, as well as in plastics.

This machine performs on flat, uniformly curved, cylindrical, spherical or irregular shapes — it works in either 2 or 3 dimensions, in all directions on a horizontal plane, and vertically. It employs enlarged masters, templates or patterns which are quickly and easily made and operates normally at a reduction ratio thereby increasing accuracy — exclusively characteristic of the pantograph.

Single or repetitive accuracy — from one piece to thousands — manual or full automatic operation depending upon quantities — work sizes from the size of a dime to as large as 10 feet.

A new booklet, "Pantography," explains the process and shows what this type of machine can do for you. It is yours without obligation. Write for it today. If interested, also ask for our latest General Catalog 1655. Address the George Gorton Machine Co., 1511 Racine Street, Racine, Wisconsin, U. S. A.

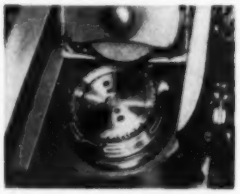


ARTER MODEL D

HYDRAULIC ROTARY SURFACE *Grinder*

. . . for work requiring the utmost precision for flatness, size and finish. For angular grinding, a rigidly mounted spindle insures concentricity. Electric magnetic chuck, 13" or 17", holds work as small as 1½" diameter. Smaller parts held by shellac on iron plate. Shoulder, filet diameters ground with side of wheel.

Inserted carbide tooth milling cutters ground on standard machine. Extra equipment permits revolving grinding wheel and chuck in either direction, independently controlled.



Machine built especially for grinding 45° angles on cutters. Flat surfaces also can be ground. Both wheel and chuck have reversible direction drives.

Write today for complete details and specifications.

Arter GRINDING MACHINE CO.
WORCESTER 5, MASSACHUSETTS

WORLD'S LARGEST PRODUCER of
Low Cost, Precision
DIE CUT STAMPINGS
In Small Lots
YOUR INQUIRY INVITED

DAYTON ROGERS
Manufacturing Company
2826 13th Ave. S. Minneapolis 7, Minn.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT — BUSINESS EQUIPMENT — USED OR RESALE

OPPORTUNITIES

Executive Engineers 8 to 15,000. Designers—all kinds to 12,000. Tool Designers—Engineers 6 to 12,000. Detailer, Draftsmen and Trainees—Highest Pay—FREE. Employers pay our fees on the above. We also place all types of manufacturing executives, office and sales executives.
J. L. OVERHOLT, Wabash Employment Agency
202 S. State St., Chicago, Illinois

SALESMEN

COMPANY
Large, well financed, progressive, respected, rapidly expanding, operating internationally.

PRODUCTS
Machine shop consumables.

LOCATION
Several available, limited travel by auto which is furnished, expenses paid.

COMPENSATION
Salary, commission, bonus, pension.

EXPERIENCE
Qualified to handle the everyday problems of a general machine shop with background such as foreman, tool engineer, etc. Grinding experience particularly desirable. Sales experience not required. Training in selling available on the job.

AGE
Not limited but in the 30's preferred.

Replies will be held in complete confidence. Give details of experience and current earnings. Our employees know of these openings.

SW-5539, AMERICAN MACHINIST
520 N. Michigan Avenue
Chicago 11, Illinois

WANTED

Exclusive representatives for selling small diamond carbide tungsten metal bonded tools (from .030 up) used in any Internal Grinder or Jig-Grinder at high or low speed for carbide tungsten, hard steel (from 60 up). Only firms representing similar lines please apply.
RW-5543, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

ADDITIONAL EMPLOYMENT ADVERTISING ON PAGE 388

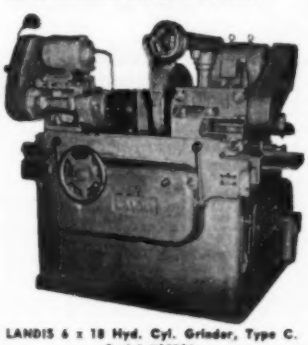
BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

AUTOMATIC, #00G Brown & Sharpe, M.D.
AUTOMATIC, Cleveland Model #8-1½" Spl. Spdl.
AUTOMATIC, Sonic #2 B & S Wire Feed, 1" screw.
BALANCER, Anderson Bros. 10"x54", Rota-Checker.
BORING MILL, 24" Bullard M.D., V.T.L.
BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 36"x54" Niles Vert. M.D., Side Head
BORING MILL, 48" Bullard M.D., 2 Heads
BORING MILL, 10' Cinci-Vert., M.D. 2 heads.
BORING MILL, 2½" Lucas Horiz., M.D.
BORING MILL, Lucas Horiz. 3" Bar, M.D.
BORING MILL, Giddings & L. #32 Horiz. 3½" Bar.
BARRELS, Tumbling Lapomatic, Schutte & Koerting.
BROACH, #3 LaPointe Horiz. 50" Str., M.D.
COMPRESSOR, Ingersoll Rand ER-1, 10 HP., M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 50 HP., M.D., 10x10, 270 CFM.
COM., Ing.-Rand ER-1, 100 HP Syn. M.D.
CRANE, GET Ricker 2 tons 11'9" span.
CRANE, Canton #8 Portable Gooseneck 3 ton cap.
CHIP WRINGER, Barrett #231, M.D., 18" dia.
CHIP WRINGER, 20" Tolhurst M.D., Late.
GAS CUTTER, Airco #4 & #10 DB Radiagraph.
RADIAL DRILL, 3'x9" Cincinnati-Bickford, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 10" Walker Turner M.D., Late.
DRILL, Fosdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #12I Baker Auto., S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2, M.D.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel.
DRILL, Edlund #2B, 3 spdle, #2 M.T., 10"
DRILL, 4 & 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, 4 Sp. Barnes H.D., M.D. #4 M.T., P.F.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Natco Multiple Spdle. #12, #1 M.T., M.D.
DRILL, Natco Mult. Spdle. Type 17, 10 Sp. #1 M.T.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S., #4 M.T., 1½" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40° below zero.
DEMAGNETIZER, 6B-911 Magnaflux, late type.
FACING HEADS, 20" & 24" Monmouth Disco.
FILER, #11-B Cochrane Bly Auto Saw Filer.
FILER, #11-S Type P4, Floor Type, M.D. Thoil
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Mashler Steam Oven, Serial #3543.
GRINDER, #1 Wilmarth Norman Hand Surf., 6"x12".
GRINDER, #2 Imperia Univ. Tool & Cutter, New.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #20S, 18" Dble. End.
GRINDER, Heald Rotary #25, M.D. 10" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillpointer.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4½".

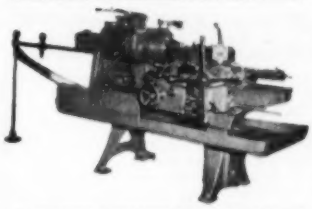


LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterheim Disc, 24" cap.
GRINDER, M.G. Sanford Surf. 8"x12" cap., New
GRINDER, 14"x36" Pratt & Whitney Vert. Surf.
GRINDER, 30" Ingersoll Tub Face Mill, M.D.
PROFILE GRINDER, Studer Type PSM, M.D., late.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.
HAMMER, Rochester Hispeed, all sizes M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
INDUCTION HEATER, 10 KVA Ecco Hi Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HOIST, 5 ton capacity Shepard Electric.
HONE, #194 Barnes Vertical, M.D., Hyd. Late
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

DISC GRINDERS

Osterheim 37" Wheel Diameter Disc Grinder, 40 HP. TEFC 3/60/440 spindle motor drive, 24" capacity.



24 WARNER & SWASEY Geared Head Turret Lathe, Motor Driven, Bar Feed, Taper Attachment.

LATHE, La-Swing 8"x100", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, Handey 12"x5' Q.C.G. Taper Attach. M.D.
LATHE, LeBlond 14"x6', Q.C.G. M.D.
LATHE, Handey 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, Ledge & Shipley 16"x6', Q.C.G., Grd. Hd.
LATHE, American 16"x8' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/26"x8' Gap Bed, Q.C.G. M.D.
LATHE, Handey 20"x10' Q.C.G., Taper Att. M.D.
LATHE, Reed-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x12' Boye & Emmes Gd. Hd., T.A., Late.
LATHE, Putnam 24/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Ledge & Shipley 26"x14', Q.C.G., M.D.
LATHE, McCabe 26/48"x18' Double Spindle Lathe.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, Bullng Dble. End 8'VMTS, Dawins Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret, #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret, #2A Warner & Swasey Univ. M.D.
LIFT TRUCKS, Baker 1 & 2 ton, Platform & Fork.
MILL #4 Burke Motor Driven, Late, M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #5Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinc. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-S Cinc. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-6, Auto. Prod.
MILL, #0 Vernon Hand Mill, M.D. Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.

No. 700 ESPEN LUCAS Hydraulic Heavy Duty Cut-off Saw, new 1945.

MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical Hi Power, M.D.
MILL, #4 Cinci. Vertical Hi Power, M.D.
MILL, #5C Becker Vert. Die Sinker, M.D.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, Gray Turret Type ⅛"x24" cap. M.D.
THREADING, Steybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Nasson-Whitney, Univ.
THREAD MILL 6x14 Pratt & Whitney No. 1168.
THREAD MILLER, Lees-Bradner #4SA Automatic.
THREAD MILLER, Plan-O-Mill #5 Planetary Form & Thread Semi-Automatic Milling Machine, Late.
PAPER SHREDDER, No 10 Mitts & Merrill, M.D.
PLANER, 24"x24"x8' Cincinnati, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #16A O.B. Dble. Crank Grd. 45 tons, 4" stroke, 50"x26" Bed Area. M.D.
POWER PRESS—Bliss-Consolidated #161-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, #183 Toledo Toggle Drawing, M.D.
PRESS, 135 ton Clearing Single Crank 8" Str., Late.
PRESS, 70N Drake Hydraulic Arbor, New.
PRESS, #78½ Bliss S.S. 9½ Str. M.D.
PRESS, Federal #2 O.B.S. Grd. 2" Str.
PRESS, Bliss #18, #10, #9, #11, OBI A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 60C Bliss Double Action, 3 crank.
WHEEL PRESS, 300 ton Hydrostatic, 48"x10", M.D.
WHEEL PRESS, Chambersburg 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #6B Whitney Dove Thr. 24" Tbl.
PRESS, P2, P1 Ferracute M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving
PUNCH, #4B Buffalo Force Vert. Cap. 1"x⅝" M.D.
PUNCH, R-6 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, R-4I-P Wiedemann Turret, 14 stat. 24" thr.
PUNCH, Hacker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH, H & J #3 Sgle end, 48" Thr. 2" thru 1½".
RIVET SETTER, ⅝" cap. Penn. Tubular Rivet.
ROLLS, Bertsch Pyramid 10"x1⅛" cap., M.D., Late.
ROLLS, #1 Buffalo Force Wrapping, M.D.
COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Hack Saw 6"x9" Cap., M.D.
SAW, #8 Marvel Band 18"x18" cap., M.D.
SAW, #36C Campbell Abrasive Cut-off, M.D.
SAW, #29-C Racine Shear Cut 6"x9" cap., M.D.
SAW, Band, Tannewitz GH-36" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci. S.S., Motor driven, M.D.
SHAPER, Morton 30" Draw-Cut, 4-Speed, M.D.
SHEAR, #542 Niagara 42"x½" cap., 15° gap., M.D.
SHEAR, #2B Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #-1 Rotary 90° Throat, 18 ga.
SHEAR, #8E Niagara M.D. 8"x3/16" cap. M.D.
SCREW SLOTTER, #2 Waterbury Farrel Auto. M.D.
SCREW SLOTTER, #117 Kent, M.D., Late
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap. M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 CAM Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
BRINELL, Tester Machine, Type UK1000M, Steel City.
BRINELL, Tester Machine, Type 030R, Steel City.
WELDER, 500 amp. Westinghouse Flexarc A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

OVER 2000 MACHINE TOOLS AVAILABLE IN STOCK

WHY SEARCH?

WE CAN SUPPLY YOU WITH ALL YOUR MACHINE TOOL NEEDS

OVER 30 YEARS EXPERIENCE

AUTOMATICS

5/16" OOG Brown & Sharpe
1¼" Conomatic, 8 spindle
8", 6 spindle Bullard "A" Mult-Au-Matic
8", 6 spindle Baird Chucker, Model B.
14" x 33" Fay
20" x 25" Fay
Gisholt Simplimatics

BORING MACHINERY

3" Universal horizontal, table type
3" Rockford horizontal
4" Detrick & Harvey floor type
American vertical precision

BROACHES

No. 1 Foote Burt duplex surface
2 ton Model HO American horizontal hyd.
10 ton No. 3XA Oil Gear horizontal hyd.
12 ton V12 American vertical hyd.
18 ton V42 American vertical hyd.

COMPRESSORS

179' Model 40T Ingersoll Rand, two stage (1946)
275' 10"x10" Union Steam Pump Co.
311' 12"x8" Ingersoll Rand
327' 12" x 7½" x 12" Ingersoll Rand
21" x 13" x 16" Laidlaw

COMPLETE MACHINERY SERVICE

GRINDERS

No. 2 Cincinnati centerless
Model H Landis cyl.
6" x 30" Cincinnati Filmatic cyl.
10" x 18" Norton type C cyl.
21" No. 6-21-1 Besly opposed disc
22" No. 22B Hanchett opposed disc
23" No. 84 Gardner opposed disc
30" No. 84A Gardner opposed disc
53" No. 24 Gardner horizontal disc, direct motor drive
No. 72 Heald Gagematic & Sizematic
12" & 16" No. 22 Heald rotary surface
No. 2 Brown & Sharpe universal
16"x48" Landis crankpin grinder
No. 42 Van Norman radius grinder

MILLING MACHINES

No. 2 Cincinnati plain, motorized
No. 3 LeBlond plain, motorized
No. 3B Kearney & Trecker, SPD
12" x 18" Cincinnati Mfg.
24" Cincinnati automatic duplex
4-36 Cincinnati hydromatic bed type
Nos. 32 & 33 Kempsmith plain Mfg. mill
Ingersoll rise and fall
4" No. M80 Taylor & Fenn spline
8" x 16" Hanson Whitney thread
No. CT 36 Lees Bradner thread

MONEY BACK GUARANTEE

PLANERS, SHAPERS & SLOTTERS

30" x 30" x 10' Cincinnati, box table
36" x 36" x 8' American double housing
36" x 36" x 8' Cleveland OS, one rail, one side head
36" x 36" x 10' Niles, AC motor drive
26" Smith & Mills back geared shaper, motorized
26" Worcester heavy duty shaper
26" Morton draw cut shaper
32" Ohio "Dreadnaught" motor drive shaper
36" Niles traveling head shaper
10" Betts slotter
12" and 16" Bement slotter
24" Niles Bement Pond Slotter

MISCELLANEOUS

3½"-8" American sensitive radial drill
¾" McCabe pneumatic flanger
Nos. 5N & 6B Hazel pneumatic forging hammers
16A16 Bryant Grinder
No. 7B Wilmarth & Mormon surface grinder
30" x 16' LeBlond Engine lathe
No. 5 Acme universal turret lathe, late
No. 5 Gisholt universal turret lathe, late
80 ton No. 50-D-36 Cleveland SS Dbl. Crank press, late
600 ton No. 2316½ Hamilton eccentric shaft coining and forging press
600 T. No. 570 Toledo hi-speed forging press
10'x10 gauge George Ohl Sq. Shear
9/16" National Electric welder, thread roller

WRITE FOR LATEST CATALOG

MILES MACHINERY COMPANY

2025 E. GENESEE AVE. • SAGINAW, MICHIGAN

Phone Saginaw 2-3105

Botwinik

Bargains & Buys

BORING MILLS

Giddings & Lewis #90T Horizontal—Table 18"x26"—Table cross travel 24"—Spindle speeds 30 to 2000 RPM—MD—1948 machine—Like new

Bullard 24" Spiral Drive—Side head—3 jaw chuck table—Coolant—MD—Late Type

Bullard 42" Spiral Drive—Side head—4 jaw chuck table—MD

DRILLS—RADIAL

American 4'13" Triple Purpos —32 speed head—14¾" spindle traverse—Tumbler gear box—MD

Cincinnati-Bickford 7'22" Master Type—Box table —Straight base—24 Speed Head—AC MD

GEAR CUTTERS

Barber-Colman #3 Standard—High speed hob swivel —Lower operated collet and overarm support—MD—Late type

Mikron #102 Universal—Cap. 4.00" dia. x 4.40" long—Coolant—MD—Late Type

Fellows #4 Gear Shaver—For fine pitch external spur & helical gears—MD—1944 machine

MISCELLANEOUS

Heald #72A Universal Internal Grinder—Swing 26" —Max. dia. ground 11"—Sizing bracket—MD—1943 machine

Blanchard #16 Rotary Surface Grinder—Chuck 30" dia. Rectifier—MD—Late Type

Midland #4 Univ. Ram Type Turret Lathe—Cap. 2" round—Pneumatic bar feed—Coolant—MD—1943 machine

Gray 36"x36"x8' Openside Planer—1 rail and 1 side head—Helical gear drive—Table whg surfaces 98½"x32"—MD

Bertsch 18'x1¼" cap. Pyramid Bending Roll—100 Hp main drive and 50 HP elevating motors—1944 machine—Excellent condition

This is only a partial listing of our huge stock of Machine Tools of every make and description.

Send for our free catalog "The Plant That Answers 1001 Machine Tool Problems."

America's Foremost Machine Tool Rebuilders

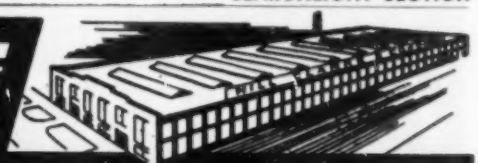
Botwinik Brothers of Mass. Inc

MODERN MACHINES

#64 Fellows Gear Shaper, Ser. #26113
#64A Fellows Gear Shaper, Ser. #25634
6' American Radial Drill, Ser. #55592
Ledge & Shipley Lathe #29051—18" Jaw chuck
Reed Prentice Engine Lathe
60" Hanchett Face Grinder
6D Potter & Johnston Automatic Chucking Machine
10" Gould & Eberhardt Shaper, Ser. #867A7
Cincinnati #3 Miller—Ser. A1004-B
5' Reed Prentice Radial Drill—Serial #5121
Onsrud Pin Router, Serial #2523
Rowbottom Cam Miller and Motor Serial #135/40 rebuilt and guaranteed
20" Knight Rotary table—Motor Driven
#32 Lucas Precision Horizontal Boring Mill Serial #32-19-21
#72A Heald Sizematic Internal Grinder Serial #24498

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1857 • H. W. MONS, President • W. L. DITFURTH, Vice President • T. H. PRICE, Secretary

At INTERNATIONAL HARVESTER COMPANY'S TRACTOR WORKS, Chicago, is this Hill-Clarke Reconditioned 16"x33" Fay Automatic, used for first turning operation on tractor front idler shafts. International Harvester Company has been purchasing machines from Hill-Clarke for the past 45 years.

PLANERS—(Continued)

42"x42"x10' Cincinnati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
48"x48"x12' Gray Maxi-Service
60"x48"x27' American, 4 hds.

MISCELLANEOUS

6"x6" capacity Marvel Hack Saw
1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
5 Ton Fox hydraulic Press
2—12"x96" Magnetic Chucks
20"x1" cap Southwark Roll
14"x⅝" cap Niles-B-Pond Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper

AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1—Spdl—24" Sw—No. 2 MA6 Avey
2 Spdl—24" Sw—No. 2 Aveymatic
2 Spdl—24" Sw—No. 3 Avey
D-31 Fox Multiple Drill, No. 2 Taper.
6' Western Radial

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x60" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
18"x96" centers
18"-40" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. 4—12"x60" B&S Univ. Gd.
No. A-3—12" Arter Rotary Surf.
5A Bryant Internal
5B Bryant Internal
No. 14-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

LATHES

19"x8' LeBlond Hvy. Duty Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4R Libby Turret (1942)

☛ CONSULT US ABOUT REBUILDING your own MACHINERY. We rebuild customer-owned tools. Years of experience.

LATHES (continued)

No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt
No. 4A Warner & Swasey—7⅛" Hole—Spdl.

MILLING MACHINES

54"x30"x16' Ingersoll Slab Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
12"x102" Lees Bradner Thrd. Mill

PLANERS

36"x36"x12' Cincinnati, 2 hds.
56"x36"x12' Gray, 2 hds.

Attention!

of

SPECIAL INTEREST

Machine above

26" Swing 19" Stroke. No 24-26 Bryant Hydraulic Internal Grinder in stock as all listing on this page. Available for immediate delivery.

FULL MONEY-BACK GUARANTEE

1. **Hill-Clarke gives you an unconditional money-back guarantee.**
2. **All machines in stock.**
3. **You can see your machine run and tested under power in our plant before purchasing.**
4. **Complete and modern facilities plus experienced craftsmen for REMANUFACTURING machine tools in our 58,000 sq. ft. plant.**
5. **A responsible organization — with 85 years' experience.**

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD CHICAGO 6, ILL. PHONE SE

HARVEY GOLDMAN PRESENTS

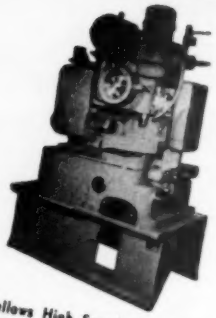
This Trade Mark Stands For:

- THE FINEST MACHINE TOOLS
- 3 GENERATIONS OF EXPERIENCE
- GUARANTEED SATISFACTION

CONSULT US WHEN YOU WANT THE BEST!

- AUTOMATICS
- BROACHES
- DRILLS
- GRINDERS
- LATHES
- MILLS
- PLANERS
- PRESSES
- SHAPERS
- MISCELLANEOUS

FOR IMMEDIATE DELIVERY



Type #7 Fellows High Speed Gear Shaper suitable for both spur and helical internal and external gears.

Reconditioned, fully guaranteed.

Available for immediate delivery.

HARVEY GOLDMAN & CO.

3910 SCHAEFER HIGHWAY • DEARBORN, MICHIGAN

TELEPHONE: TIFFANY 6-4450

THE FOCAL POINT FOR PRODUCTION MACHINERY

LATE MODEL MACHINE TOOLS . .

AUTOMATIC SCREW MACHINES
No. RA-6 9/16" Acme Gridley, 1942
No. RA-4 1¼" Acme Gridley, 1943
2" Model A Cleveland, 1942
1-1/16" Model "A" Cleveland, 1943

BROACHES
HP—100 La Pointe Hyd. Horizontal, 1945

DRILLS, RADIAL
3'11" Archdale Radial (English), 1947

GEAR EQUIPMENT
No. 7 Gleason "Revex" Roughor, 1943
No. 6 Gleason Revacycle Generator, 1943
No. 72 Fellows H.S. Gear Shaper, 1942
18" Pratt & Whitney Hyd. Gear Grinder, 1942
Red Ring Universal Gear Checker, 1942
20M Fellows Red Liner Gear Tester, 1942

GRINDERS, CYLINDRICAL
10"x72" Norton Plain Type "C", 1941
16-20x36" Norton Plain Type "C", 1942
14"x160" Norton Plain Type "C", 1942
12"x80" Fitchburg Plain Hyd. 1942
12"x48" Cincinnati Universal, 1942
10"x18" Landis Plain Type "C", 1940

GRINDERS, INTERNAL
No. 72AJ Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943
No. 16 CP 16 Bryant Hydraulic, 1942
No. 16-16 Bryant Hydraulic, 1942
No. 172 Heald Hydraulic Gap, 1940

GRINDERS, RADIUS
No. 72 Van Norman Radius Grinder, 1942

GRINDERS, SURFACE
No. 22 Heald Rotary 22" chuck, 1944

GUN BARREL MACHINES
No. ½ B x 30 Pratt & Whitney Rifler, 1942
No. ½ B x 30 Pratt & Whitney Reamer, 1942
No. ½ B x 30 Pratt & Whitney Reamer, 1942

LATHES, ENGINES
30"x290" American Geared Head, M.D.
30/46x150 Selop Gap Lathe, New.
27"x192" Niles "Timesaver" Lathe, 1941
27"x210" Lodge & Shipley Gap Lathe, 1940
26"x96" Betts Bridgeford Lathe, 1940
25/45x120 Oldfield-Schofield Gap, New

LATHES, PRODUCTION
No. 5D Potter & Johnston Automatic, 1941
No. 4D Potter & Johnston Automatic, 1942
8"x84" La-Swing Semi-Auto, 1941
Lipe-Carbo-Matic, Lathe, 1942

LATHES, TURRET
No. 1L Gisholt Universal Saddle Type, 1942
No. 3R Gisholt Universal Saddle Type, 1943
No. 4R Gisholt Universal Saddle Type, 1943
No. HS Libby Universal Saddle Type, 1939
No. 5W Acme Universal Way Type, 1942
No. 5 Gisholt Universal Ram Type, 1942
No. 3 Gisholt Universal Ram Type, 1942
No. 4R Libby Universal Ram Type, 1942
No. 6R Denver Universal Ram Type, 1942
No. 3R Libby Universal Ram Type, 1942

MILLS
No. 3 Van Norman Plain, 1942
No. 2K Milwaukee Plain, 1941
No. 4B Milwaukee Plain M.D.
No. 3 Cincinnati Vertical, M.D.
No. 2G Kempsmith Universal, 1947
No. 1-1B Cincinnati Auto, 1941
No. M-1B Milwaukee Auto, 1943
No. 2 Alsera Plain Mill, New
No. 2 Saimp Universal Mill, New
No. 2 Saimp Vertical Mill, New

MISCELLANEOUS
2000 HP Midwest Dynamometer, 1942
75 HP Gardner Denver Air Compressor, 1945

PLANERS AND SHAPERS
14" Brook Plain Shaper, New
16" Brook Plain Shaper, New
16" Garnetti Universal Shaper, New
20" Garnetti Universal Shaper, New
24" Garnetti Universal Shaper, PRT, New

PRESSES
650 Ton Verson Double Action Eccentric, 1940

Partial Listing — Write for latest stock list

INDIANAPOLIS Machinery & Supply Co.

1961 S. Meridian St. . . Indianapolis, Indiana

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

GRAY 36"x36"x8' Planer, 2 heads on cross rail; motor driven. Thoroughly rebuilt and guaranteed.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #2B—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL. B & S #11. 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to rem. 2 tables. (PLANER SHAPER)

WE HAVE A LARGE STOCK FROM WHICH TO SELECT. TELL US WHAT YOU WANT.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88 Columbus 16, Ohio

1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILING MACHINES

ALLEN: #2 High Speed, 15" overhang
CINCINNATI-BICKFORD: 1¼" upright
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers

HONING MACHINES

BARNES: No. 306H Vertical 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

JIG BORING MACHINES

Pratt & Whitney #1 Jig Borer
Swiss #5B Jig Borer
Lindner #14 & #15 Jig Borer, new

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: 2Fx40" dia., for flat work
NORTON: No. 26 Hyprolaps, for flat work & Cylindrical lapping.

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
Reinecker Relieving Lathe (new)
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LE BLOND: Regal, 15" swing x 42" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
POTTER & JOHNSTON: #6 DREL Automatic
PROGRESS: Geared head 16" to 30" swing (New)
TRIPLEX: 14" dia. x 40" centers Toolroom Lathes (new)
VDF New Engine Lathe 49" swing x 20' centers
VDF New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

SCHIESS: 41", 65" and 79" Vertical Turret Lathes (New)
WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
BULLARD: 64" & 84" Vertical Turret Lathe
HERBERT: #2, #4, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work.

PRESSES

Gen. FLEX: Screw Press, 3 ton
LOGAN: 5-Ton Vertical Hydraulic Press

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

SHAPERS

HERCULES: 16" & 22" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former.
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
PRESS: Screw, Gen. Flex. 3 ton
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
GOGAN BRINELL Hardness Tester Model 16-J
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 16" & 22" (New)
SUNDSTRAND: 44" Double End Centering Machine
WIRE FORMING MACHINES: 4-slides (new)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

BORING MILLS-Vertical

STOCK DELIVERY

BETTS (CONSOLIDATED) 120"—2 swivel heads; P.R.T.; M.D.

BULLARD 8', 16" type A Mult-au-matic; 6-spindle; M.D.

COLBURN 72"—2 swivel heads; P.R.T.; M.D.

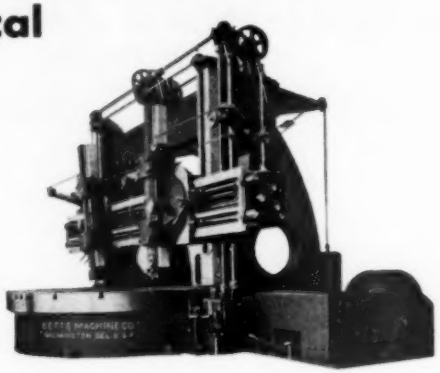
NILES 53" heavy pattern; 2 swivel heads; M.D.

NILES-BEMENT-POND 100"; 2 swivel heads; P.R.T.; M.D.

NILES-BEMENT-POND 120"; 2 swivel heads; P.R.T.; M.D. (heavy)

ASK FOR CATALOG OF AMERICA'S FINEST STOCK

Wire — Phone — Write



BETTS (CONSOLIDATED) 120" Vertical Boring and Turning Mill. POWER RAPID TRAVERSE—Adjustable cross rail with 2 swivel heads; geared feed; motor drive. Dia. of table—108". Maximum swing—122". Maximum distance under cross rail—90". Face of cross rail—24". Face of column—10".

MOREY ...for machine tools!

MOREY MACHINERY CO., Inc.

Manufacturers • Merchants • Distributors

410 BROOME ST. • NEW YORK 13, N. Y.

Telephone: CAnal 6-7400

FAIR DEALING PRICES FROM FAIRFIELD

A DEALER OF ESTABLISHED REPUTATION

Three Unusual Tools — All Late

6" x 48" Thompson Hydraulic Broach Grinder.

Cleveland 6 Spindle Automatic Chucker, 4¾" capacity.

Leland-Gifford 2LMS 6 Spindle Drill Press with back gears and power feed to all spindles.

FAIRFIELD EQUIPMENT Company DEALERS IN USED REBUILT & NEW MACHINERY

75 SANFORD STREET at R.R Station Phone FAIRFIELD 9-3321 FAIRFIELD,CONN.

WORLD'S LARGEST INVENTORY

NEW AND GUARANTEED REBUILT EQUIPMENT

MOTORS TRANSFORMERS GENERATORS DIESELS

WRITE, WIRE OR PHONE

ELECTRIC EQUIPMENT CO.

L. D. (Long Distance) 65

ROCHESTER 1, NEW YORK

Explosion Proof Motor Headquarters

BRAND — NEW 4' RADIAL DRILL

13¾" column dia.

Morse taper #4

12 spindle speeds 45-2000

Boxtable—Pump,—2 Motors

No priority necessary

Immediate delivery from stock

MACHINE & TOOL CO.

29-28 41st Ave. Long Island City 1, N.Y.

GRINDERS

Abene Hydraulic Surface Grinder, (New, made in Sweden) Type PLS-10, S/N 207, with longitudinal and transversal feed, with a 5 x 12 per. mag. chuck.

Milwaukee Face Mill Grinder, S/N 7-4242 (1943), with blower system.

#2 Oliver Arc Face Mill Grinder, S/N 2C-507, Cap. 4" thru 26" in diameter.

Oliver Templet Tool Bit Grinder, S/N TT-BG-20-103. Cap. Tool Bits up to 1½" wide x 1¾" high.

Gleason #4 Angular Bevel Tester, S/N 19186 (1943) Max. distance from end of spdl. nose to center of machine 3".

Gleason #12 Generator Tool Sharpener, S/N 18606 (1940) Cap. both right and left hand cutters, of ½", 1-1/10", 1½", 2", 3½" and 6" diameter can be sharpened on this mach.

Dauber Kratsch Tool & Cutter Grinder, S/N 179 (1937). This machine is equivalent to a #13 B & S.

Norton OD Grinder 10 x 60, Type C Mechanical Traverse 1941 machine.

THREAD ROLLER

#40 Waterbury Farrel Horiz. hand feed Thread Roller.

National Hydraulic Thread Roller, S/N X2667 (1944) ⅜" cap.

NIBBLER

Whitney Jensen Nibbler (1944) 1" cap. foot operated.

BORING MILL

Colburn 50" Vert. Boring Mill with 1 universal rail head and 1 stationary head.

SHEAR

Niagara Shear #410, 10' 14 gauge, S/N 44318 (1944) induction gear motor and back micrometer gauges.

WOODWORKING MACHINE

Oliver #34DD Double End Sanding Machine, S/N 55566 (1942).

CAN MACHINERY

Automatic Can Labeling Machine Standard Knapp Corp. S/N 9865 (1944) will label approx. 300 units per minute.

ED SMITH MACHINERY SALES

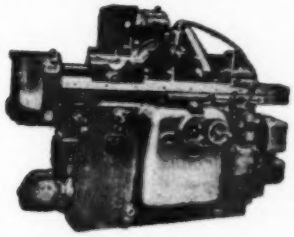
1529 Lillibridge Detroit 14, Mich.

VA 2-4820

NEW and LATEST TYPE REBUILT MACHINE TOOLS FOR SALE or LEASE

LATHES

MONARCH Model EE 19"x20" Toolroom
MONARCH Model N G.H. Engine Lathe 33½"x120" oc
LODGE & SHIPLEY G.H. Engine Lathe 24"-27"x16' oc
AMERICAN G.H. Engine Lathe 24"-27"x96" oc
AXELSON G.H. 24-Sp. Engine Lathe 16"x34" oc
LEHMANN G.H. 10-Sp. Engine Lathe 18"-20"x82" oc
AMERICAN G.H. Engine Lathe 10"-18½"x30" oc
MONARCH Model ST Multi-Tool Mfg. Lathe 12"x16" oc
HARDINGE 2nd Operation Lathe 1" Cap.



JONES & LAMSON MODEL TG 12 x 45" AUTOMATIC THREAD GRINDER

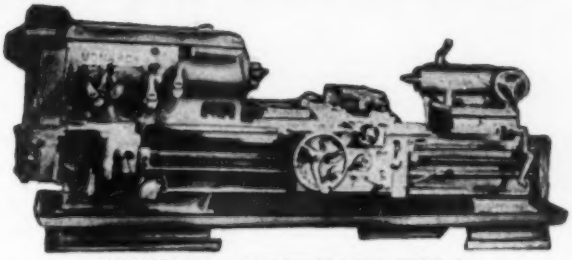
TURRET LATHES

WARNER & SWASEY Mod. 2 G.H. Ram Type 1" Cap.
WARNER & SWASEY Mod 2 G.H. Ram Type 1⅛" Cap.
BARDONS & OLIVER Mod 2 G.H. Ram Type 1" Cap.
BARDONS & OLIVER Mod 3 G.H. Ram Type 1⅛" Cap.
WARNER & SWASEY Mod 3 G.H. Ram Type 1⅛ Cap.
GISHOLT Mod 3 G.H. Ram Type 1⅛" Cap.
WARNER & SWASEY Mod 5 G.H. Ram Type 2⅛" Cap.
GISHOLT Mod 5 G.H. Ram Type 2⅛" Cap.
FOSTER Mod 18 Univ. G.H. Saddle Type 2-9 1/16" Cap.

GRINDERS

BROWN & SHARPE Model 2 Internal-External Universal Grinder 14"x30" Cap.
CINCINNATI Univ. Hydr. Cyl. Int.-Ext. Grinder 12"x 36" Cap.
ROTOREX Model 101-A Universal T & C Grinder, w/Int. Att.
COVEL Model 91A Univ. T & C Grinder
JONES & LAMSON Model TG-12x45" Auto. Thread Grinder
EXCELLO Model 35 Thread Grinder
EXCELLO Model 31 Thread Grinder

CINCINNATI 12" x 36" HYDRAULIC UNIVERSAL GRINDING MACHINE INT. EXT.



MONARCH 33½" x 120" ENGINE LATHE—MODEL N

LAPPING MACHINES

ULTRALAP Model 10 Vert. Lapper

TAPPING MACHINES

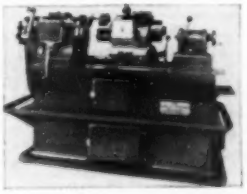
BAKEWELL Model 2 Tapper ¾"—2½" Cap.

MILLING MACHINES (Horizontal)

VAN NORMAN Model 36 Ram Type Duplex
NEW CENTEC Model 2A Universal With Vert. Att
MILWAUKEE No. 1-B Universal Miller
BROWN & SHARPE Mod 10 Auto. Production Miller
CINCINNATI Mod 00 Plain Horiz. Auto., Cycle

MILLING MACHINES (Thread)

PRATT & WHITNEY Model C-M-1804 Thread Miller 4½"x36"
HANSON & WHITNEY Univ. Semi-Auto. Thread Miller 10"x48"



HANSON & WHITNEY UNIVERSAL SEMI-AUTOMATIC THREAD MILLING MACHINE 10" x 48"

MISCELLANEOUS

FAMCO #0, 8, 10, 12, 15 Foot Presses (NEW)
EXCELSIOR #8, 8, 10, 12, 15 Foot Presses (NEW)
ARBOR PRESSES (NEW)

VERTICAL MILLER

GORTON Model 8D Super Speed Vertical Miller

PRESSES

WIEDEMANN Model R11P 10 Sta. Power Turret Punch
RUESCH #2 Percussion Press
POWER PRESSES (New)

AUTOMATICS

BROWN & SHARPE Model 00G ¾" Cap.
CLEVELAND Model A Single Spindle 9/16" Cap.
CLEVELAND Model A Single Spindle 1-1/16" Cap.
CLEVELAND Model A 1¼" Cap.
CLEVELAND Model B Single Spindle 1½"—1⅝" Cap.

BORE-MATICS

EXCELLO Model 2112A Single End Double Spindle Hyd. Cross Slide Table

DRILLS

NEW G. M. S. R. Type T.B. 2 Radial 4'x12" Column
NEW ZEWO Universal Floor Type Radial 21"x16'
NEW CANEDY OTTO 18" Single Spindle ⅝" Cap.
NEW FAMCO 15" Bench Type Drill Presses ½" Cap.
NEW FAMCO 15" Floor Type Drill Presses ½" Cap.
MORRIS MOR-SPEED RADIAL 3'x8" Column
LELAND GIFFORD 2 Spindle

GEAR EQUIPMENT

BARBER-COLMAN Type 5 Gear Hobber
FELLOWS 5" Fine Pitch Shaper
GLEASON 12" Straight Bevel Generator—Finisher—Roughor
GLEASON 3" Straight Bevel Generator
GLEASON 3" Spiral Bevel Gear Generator
GLEASON 2" Bevel Gear Tester
GLEASON Model 6 Angular Hypoid Tester
GLEASON 10" Spiral Bevel Generator
BARBER-COLMAN Model 12 Hobber 12" Cap.

PROFILERS

PRATT & WHITNEY 48-Inch Profiler 2 Side Heads
PRATT & WHITNEY 30" Single Spindle

SHAPERS

HENDEY Universal H.S. Crank Shaper 12"
GOULD & EBERHARDT Industrial Shaper 30"

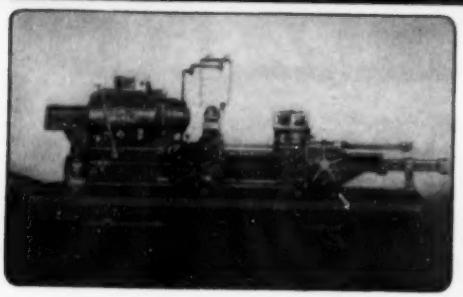
SHEARS

COLUMBIA 90°x¼" Cap. 18" Gap Power Shear
PEXTO 44" Geared Power Gap Shear
NIAGARA Model 412 Power Shear 12'x16 Gauge

NIAGARA #412 POWER SQUARING SHEAR 12' x 16 GAUGE

MACHINERY RENTALS, INC.
197-199 MOTT STREET NEW YORK 12, N.Y.
PHONE: WORTH 4-7615

An Exceptional Stock of PRECISION MACHINE TOOLS



ESTABLISHED 1905

J. L. LUCAS & SON, Inc.

MACHINE TOOLS

BRIDGEPORT 5A, CONN. TEL. FAIRFIELD 9-3393 CABLE—"LUCASTOOLS"

BORING MILLS

24" Bullard Vertical Turret, Serial 15656. Spiral Drive Threading Attachment
36" Bullard Vertical Turret, Serial 20926. Spiral Drive Threading Attachment
42" Bullard Vertical Turret, Converted to Spiral Drive
100" Betts Heavy Duty Boring and Turning Mill

GRINDERS

6"x36" Norton Plain Hydraulic
10"x36" Landis Type C Plain Hydraulic—1941
14"x36" Norton Plain Hydraulic—Plunge Grinding—1942
10"x24" Landis Type C Hydraulic—Universal—1939
12"x36" Norton Type L Hydraulic—Universal—1941
12"x36" Cincinnati Universal—Universal—1940

GRINDERS—Miscellaneous

#186—30" Gardner Horizontal Disc—1941
#24—53" Gardner Horizontal Disc—1939
#95—110" Bridgeport Face Grinder—1943

LATHES

14"x30" Reed Prentice Sliding Gear Head—1939
14"x54" Lodge & Shipley High Speed Engine—1941
16"x48" Bradford Quick Change—1940
18"x84" Sidney—1941

MILLERS

#1210—Milwaukee Simplex—1941
#1854—Milwaukee Duplex—1942
#4K—Kearney and Trecker Plain—1942
#4 Cincinnati Plain Horizontal—1942
#4-36 Cincinnati Hydromatic Horizontal—1939
#2 Cincinnati Vertical—1943
#4 Cincinnati Vertical—1942
FV5MZ—Skoda Vertical—Table 31"x91½"—1942
36"x36"x16' Ingersoll Three Head Adj. Rail Planer Miller

TURRET LATHES

#3 Gisholt Ram Type Universal—Bar Feed—1941
#4 Gisholt Ram Type Universal—1939
#5 Gisholt Ram Type Universal—Bar Feed—1942
#1L Gisholt Saddle Type Universal—1942
#2L Gisholt Saddle Type Universal—1941
#2 Warmner & Swasey All Geared Head—1939
#4 Warner & Swasey Universal—1940

McDONALD
USED MACHINERY

Landis 20"x72" and 18"x90" Plain Ext. Grinders.
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table.
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking.
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.D.
Cincinnati 36"x36"x10' D.H. Planer 2 Hds. Box Table.
Heald No. 72A-3 Hydr. Int. Grinder Rod Head Sp.
LeBlond 27"x12' Bed Grd. Hd. G.C.G. Lathe 13" hollow spindle.
Norton 6x18" Horiz. Hand Surf. Grinder 1941.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
G & L 3" Bar Horiz. Boring Mill.
20" All Grd. Camel Back Drill 1-Sp. and Barnes.
Amer. 3' & Morris 3½" Arm Radial Drills.
Blanchard M.D. Vert. Sp. Surf Grinder 28" chuck.
Campbell No. 213 abrasive cut off 1947.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Hot. Surf. Grinder 12" chuck 1947.
Nazel #5-B Vert. Air Hammer A.C. M.D.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"18" bed G.C.G. Lathe 1939.
W & S No. 4 Ram Type Grd. Hd. Turret Lathe
G & E 36" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cont. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
Heald #78-A Rod Head Sp. Internal Grinder.
Springfield Planer Type Surf. Grinder.
P & J #2-M Auto. Prod. Miller, 2 Tables.
Foote-Burt #25 Box, Col. 1-Sp. Hvy. Drill.
L & N. 9', 10' & 12' Press Brakes.
Bullard 24" & 39" Vert. Turret Lathes.
Lynd-Farquhar 28" stroke openside Shaper Planer.

MONA MACHINE CO.

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

P. & W. 30" 2-Spindle Vert. Profiler
Fellows Straight Line Gear Generator
Hardinge Model MD-37 Lathe, ½" cap.
P. & W. 4½" x 36" Thread Mill, 1941

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

NEW AND USED

2—Potter & Johnston auto. Turret Lathes Model 6-DREL
2—Herbert Universal Turret Lathes #9S #4
2—Bardons & Oliver Turret Lathes #7 #5
3—Cincinnati Vert. Mills #0-8
2—Girards Radial Drills 3 ft. 4 ft.
2—Double end Centering Machines 10x42
1—Jones & Lamson auto. Thread Grinder 636
1—Bryant Hole & Face Grinder 16A22
1—Kent Owens Hydr. Miller 1-8
1—Landis Hydr. Internal Grinder 15x8
1—double spdl. Profiler 15x9
1—Heald hydr. Surface Grinder 25A
1—Arter Surface Grinder A-1-8
1—Logan hydr. Press, cap. 5 ton
2—Hi-speed V-Ram Shaper 20"

MACHINE & TOOL CO.
Long Island City 1, N. Y.

LATE MODEL TOOLS

American Type T-6-32 Broaches Three-way vertical hydraulic, single ram, 13"x18" table. Cap. 12,000#, MD with 7½ HP motor. 1942.
Barrett 1 ton Portable Shop Elevator Hinged type. Never used. Half price.
No. 320 "Barnesdrill" Multiple Cyl. Hyd. Hone, throat—10¼", spindle stroke 2" to 20", 5" dia. spindle. Sleeves with #4 taper. 1948.

RAVINE INC
new and used machinery

652 W. Willis Ave., Detroit 1, Mich.

WE BUY — SELL OR TRADE
ALL TYPES OF LATE MODEL
MACHINE TOOLS
WRITE FOR YOUR FREE COPY OF THIS MONTH'S LINCOLN LOG FOR CURRENT LISTINGS

Lincoln MACHINERY SALES CORP.
WRITE TODAY

Air Compressors, 23 to 200 cu. ft.
Header or Upsetter, 3" Ajax, M.D.
Lathe, 90"x26' s. Mackintosh-Hemphill.
Planer, 48"x48"x12' Gray, Spur Gear Drive.
Punch and Shear, No. 4 H. & J. D.E., 1½" thru 1".
Press, Trimming, No. 6 W. & W., #73½ Bliss.
Shear, 140"x⅜", No. 470 E.W. Bliss.

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

FOR SALE

NATIONAL BROACH 18" Internal Gear Shaver Serial No. GCI-661.

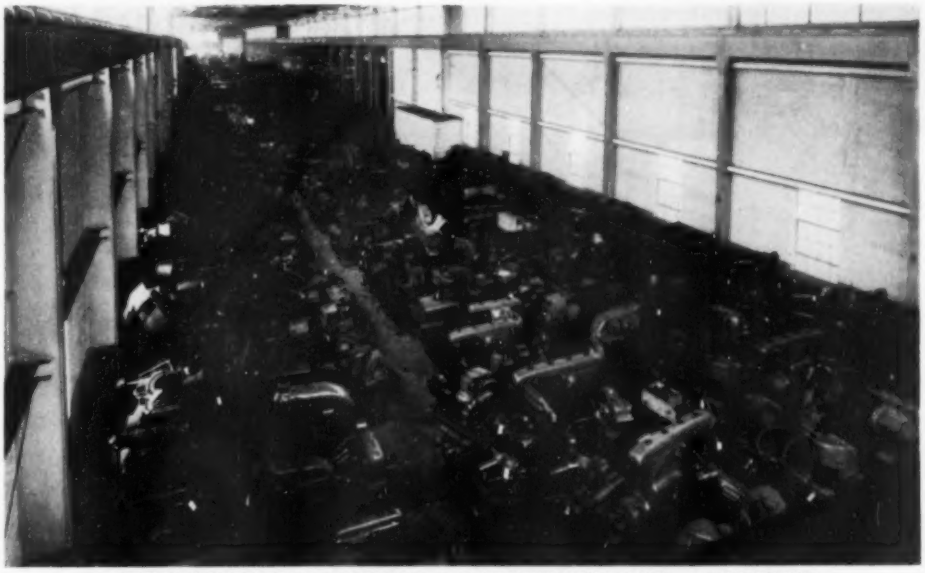
WALTER H. MEYER
MACHINERY & EQUIPMENT CO.
605 W. Washington Blvd. Chicago 6, Ill.

BOLT MAKER

National 5/16" Capacity
LATE TYPE MACHINE
Under Power in Plant
Inquire
FS-5779, AMERICAN MACHINIST
330 West 42 St., New York 36, N. Y.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY



MAIN WAREHOUSE BAY IN EASTERN'S 11 ACRE CINCINNATI PLANT — THE LARGEST MACHINE TOOL PLANT IN THE U.S.A. DEVOTED EXCLUSIVELY TO REBUILT MACHINERY. WRITE FOR COMPLETE STOCK LIST

Following Machines are a partical list of our equipment in stock. We also have in stock Automatics, Belt Cutters, Horizontal and Vertical Boring Mills, Radial Drills, Upright Drills, Gear Cutters and Hobbers, Grinders, Engine Lathes, Milling Machines, Presses, etc., etc., etc.

PLANERS

P10 Coulter Crank Type Shaper-Planer, 1 head, m.d.
20"x20"x5' Whitcomb-Blaisdell Planer, 1 head, m.d.
24"x24"x5' G. A. Gray Planer, belted m.d., 1 head on cross rail
24"x24"x6' G. A. Gray Planer, belted m.d., 1 head on cross rail
30"x30"x8' Cincinnati Double Housing, 2 rail heads
30"x30"x10' Cincinnati, belted m.d., 2 heads
36"x36"x10' Betts, belted m.d., 2 heads on rail, 2 side heads
36"x36"x10' Niles, reversing m.d., 2 heads on rail, 1 side head
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing m.d.
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' Gray, 2 heads, belt
36"x36"x24' Cincinnati, belted m.d., 2 heads
38"x38"x12' G. A. Gray, 2 heads
42"x42"x14' Niles-Bement-Pond, reversing m.d., 2 rail heads, 1 side head
42"x42"x26' G. A. Gray, 2 heads, belted m.d.
48"x48"x16' Woodward & Powell, 4 heads
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, reversing m.d., 4 heads
48"x48"x30' Cincinnati, 4 heads, m.d.
56"x42"x14' Cincinnati, belted m.d.
72"x72"x24' Betts, m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
84"x72"x30' Niles, reversing m.d.

RAILROAD MACHINERY

Niles-Bement-Pond Double Head Axle Lathe, m.d.
48" Niles-Bement-Pond Car Wheel Borer, m.d.
52" Betts Car Wheel Borer, late
90" Niles Balanced Quartering & Crank Pin Turning Machine, late
90" Niles Journal Lathe, including 2 inside Journal Turrets and 3½" spindle double quartering attachment, m.d.
90" Niles Driving Wheel Lathe, m.d., late
Niles-Bement-Pond Quartering Machine, m.d., new
500 ton Niles Double End Wheel Press

SAWS

Gustav Wagner Cold Saw, m.d.
7½ H.P. Cinti. Elec. Tool Co. Abrasive Cut-off Machine, Type JCAW
New Heller Hydraulic Cold Saw, Model SSH-9/0, complete with elec. equip.
Kalle Heavy Duty Steel & Metal Bandsaw, Model BSM 40, new
6x6" Racine Power Hack Saw

SHAPERS

18" Barker Plain Crank Shaper, cone, motorized
16" Hercules Shaper, m.d.
24" Barker Back Geared Crank Shaper, cone, motorized
24" Gould & Eberhardt Crank Shaper, m.d.
24" Potter & Johnston, cone
32" Cincinnati Back Geared, cone, motorized
32" Morton Draw-Cut, m.d., late
32" Ohio, m.d.
36" Morton Draw-Cut, m.d., late

SLOTTERS

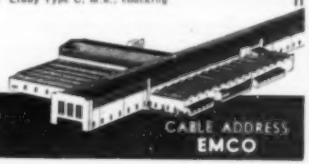
10" Newton, m.d.
10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
16" Dill, m.d.
16" Niles-Bement, s.p.d.
18" Betts Crank Slotter, m.d.
20-24" Dill, m.d.
22" Betts, m.d.
45" Niles, m.d.

SHEET METAL MACHINERY

Niles-Bement-Pond Plate Bending Rolls, 5'3", 3 rolls 7" dia., m.d.
Niles Boiler Forming Rolls, 10' long, 24, m.d.
Hyerson Rotary Bevel Shear, 4' throat
Doty Mfg. Co. Size C Plate Bending Roll, top roll 6½", bottom roll 5"
Gray Turret Head Metal Cutter, cap. ¼", 36" throat
No. 2 Libert Nibbler, 28" throat
120" No. 100 Niagara Heavy Production Folder, 16 gauge, m.d.
No. 3—⅜" cap. Gray Sheet Metal Cutter, m.d.
6' x ½" cap. No. 188 Dreis & Krump Leaf Brake, m.d.
No. 316—cap. ⅝" W. J. Savage Co. Nibbler
6' x 14 gauge Britsch Shear, s.p.d.

TURRET LATHES AND SCREW MACHINES

No. 601 Oiler Geared Head Rapiduction, m.d. in leg, chucking
No. 1 Warner & Swasey, bar, m.d.
No. 1A Warner & Swasey, m.d.
No. 1L Gisholt, m.d., Timken
No. 2 Cincinnati-Acme, Full Universal, m.d.
No. 2A Warner & Swasey, m.d., bar
No. 2F Foster Fastermatic, m.d., Timken
No. 3 Cincinnati-Acme Full Universal, m.d., chucking
No. 3 Foster, Geared Head, m.d., bar
No. 3F Foster Fastermatic, m.d., Timken
No. 4 Warner & Swasey Plain, cone, bar and chucking types
No. 4A Warner & Swasey Universal, m.d., chucking
No. 4FU Foster Fastermatic, m.d., latest
No. 5 Foster Universal, m.d., bar, late type
No. 2 Bardons & Oliver, cone
⅝" Pratt & Whitney Hand Screw Machine, cone
2½x24", 3x36", 4x34" Jones & Lamson Geared Head, m.d., bar and chucking types
18" Libby Type A, m.d., chucking
20" Acme, s.p.d., bar
20" Dreses
26" Libby Type C, m.d., chucking

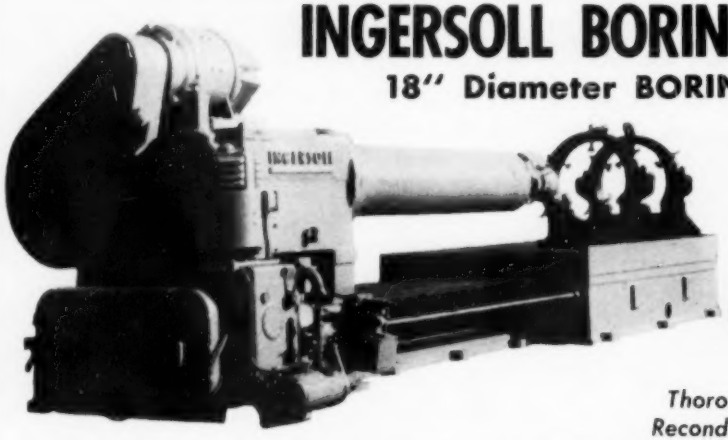


WRITE FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

INGERSOLL BORING LATHE

18" Diameter BORING BAR



SERIAL #16571—1943

complete

with

AUTOMATIC CONTROL PANEL

Thoroughly Reconditioned

Working length of boring bar 98⅜". Bed travel 125". Height of center line of boring bar over carriage 24". Over all bed length 327". Boring bar length 110". Work carriage 84" x 127" with 2-2" tee slots 8" thick. Spindle powered with 25 HP 230 volt DC motor. Spindle speeds 6 to 47 RPM. Carriage feed .375 to 17.6 inches per min. Rapid return—222" (18'-6") per min.

Location Seattle. For Inspection and Special Price Contact

LURIA BROTHERS AND CO. INC.

LEADERS IN IRON AND STEEL SINCE 1889

LINCOLN-LIBERTY BLDG., PHILADELPHIA 7, PA. PH. RITTENHOUSE 6-7455

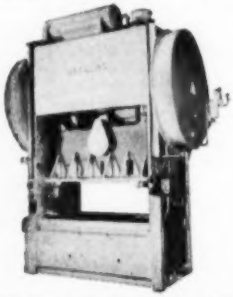
WORLD'S LARGEST STOCK

STAMPING PRESSES

BLISS • CLEARING • CLEVELAND

FERRACUTE • HAMILTON • L & J

NIAGARA • TOLEDO • V & O



SQUARING SHEARS • PRESS BRAKES

REBUILT *and* GUARANTEED

JOSEPH HYMAN & SONS

TIOGA, LIVINGSTON & ALMOND STS.

PHILADELPHIA 34, PA. Phone: REGENT 4-7777

IMMEDIATELY AVAILABLE

ROLL FORMING MACHINES

Kane & Roach 15 stand, 30" wide, 4½" dia. shaft 75 H.P. M.D.

Yoder 14" stand, 24" wide, 2½" dia shaft, 25 H.P. M.D.

Tishkin M-2 Ten stand Yoder with AC-2 Cutoff.

Rafter Tube Forming Machines, 5 & 7 Stand.

Yoder 5 stand vertical, with AC-1 Cutoff.

PARTIAL STOCK LISTING

"The most diversified stock of machinery in the country. If it's machinery we have it."

National Machinery Exchange

128 Mott St. New York 13, N. Y.

BROWN & SHARPE Automatics (several)

#12 Martin Hydraulic Marking Machine

BAIRD Cut & Carry Drawing Press

4" RICE BARTON SPLINE MILLER

DIAL FEED POWER PRESSES

SHELL THREAD ROLLERS

#10 W.F.F. Thread Rollers

30" ESPEN-LUCAS Hydraulic Cold Saw

¼" MANVILLE #1 D.S.S.D. Header

19" LE BLOND Lathe, Geared Head

#40 ANDERSON Dial Feed Tappers

Numerous Other Machine Tools

CURRIER MACHINE SALES

1055 State Street, P. O. Box 1503

New Haven, Conn.

FOR SALE

Cleveland Type G Punch, 36" Throat

Model A Libby Turret Lathe, 5" Spindle Hole

Model 3R Gisholt Lathe, 3½" Spindle Hole, 1942

RA-6 Acme Gridley 9/16 Screw Machine, 1942

#2 Brown & Sharpe Wire Feed Screw Machine

Johnson O.B.I. Punch Presses, New, All Sizes

New Foreign Make Press Brakes, Radial Drills, Milling Machines

Send Us Your Surplus & Requirements

Fort Meigs Machinery Co.

105 17th St., Toledo 2, Ohio

NATCO HEAVY DUTY DRILL PRESS

No. B225H

Excellent condition; Late

LATE TYPE MACHINE TOOLS IN STOCK

SEND US YOUR REQUIREMENTS

1311 St. Clair Ave. Cleveland, Ohio SUPERIOR 1-8500

Wade-Presdee, INC.

Westinghouse Electric Hardening Furnace, pusher type, for 16" breech blocks. Range 0 degrees to 1800 degrees.

W. C. COWDEN MACHINERY CO.

Syracuse 4, N. Y.

FOR SALE

GARDNER VERTICAL DISC GRINDER

Model #178, 72" Segment Type Wheel

Complete with Motor, Electrical Equipment and Wheel Dresser

Excellent Condition

WINSTON MACHINERY CO., INC.

326 West Ohio St. Indianapolis 2, Ind.

ELECTRIC FURNACE TO 1850°

8 x 12 x 15 inside with Auto. Temperature Control 4.5 K.W. Sliding door, cheap to operate. Substantial. Dependable for Machine Shop—Tool Room. New. $250.

E. H. WILLIAMS

BOX 9042A, HUNTINGTON, W. VA.

SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Capacity
Giddings & Lewis No. 32, 3" Capacity
King 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Hor. Bor. Mills

DRILLS AND RADIALS

Brand New Radials
American 6'x15" Univ.
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, No. 16 4 Spindle
Buffalo: Power No. 41, No. 42
Canedy-Otto 21" Sliding head New
Cincinnati Bickford 6'x15" col.
Natco #12 20 spindle drill
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" cap.
Leland Gifford 21 MS 3 MS

NEW VERTICAL MILL

ENGRAVERS

Deckel type 3 Dim., New, Deckel GI (3)
Gorton 3S Die Sinker & Engraving
Gorton 3Z with copy plate, 3U
Gorton #1A, ME
Preis—UE3—2 dimensional
Taylor-Hobson 1 dimensional Pantograph

GEAR EQUIPMENT

Barber-Colman Mod. SHS, Sharpener
Barber-Colman #2, #12 (3)
Fellows High Speed Shapers 712, 725, 71
Fellows #20M Redliner
Flather 72" Cutter
Gleason #2 Surface Hardener
Gleason No. 3 Bevel Generator
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS, MISCELLANEOUS

Bryant #5, Internal, chucking, 16A16
Cincinnati 6x18" Hyd. #4—Centerless
Grenby Models 1G1 & 1G2—Internal
Gorton Pod. Type Tool Grinder
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ.
Norton No. 2, Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6T Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

AUTOMATIC SCREW MACHINES

Brown & Sharpe (3) Model 2G, serial No's. 8500 & 11500 series, 1¼" capacity.
Brown & Sharpe (10) Model 0G, serial No's. 9600 & 10700 series, ⅝" capacity.
Brown & Sharpe (6) Model 00G, serial No's. 14, 15, 1600 series, ⅜" capacity.
Cleveland, Model AA-11, Serial #36586.
Cleveland, Model B, Serial #42618-843, 1x1/16" capacity.
Conomatic 4 Spindle, Serial 2309FF, 1½" capacity.
New Britain Gridley 61 6 Spindle, Serial No. 25410, 1⅝" capacity.

GRINDERS, SURFACE

New 8x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hyd.
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base, 2A 6x18
Taft Pierce #1 Precision

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Hendey 12"x42" and 12x30", 1941, 16x66"
Hendey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed, 19x42"
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, #3 Duomatics
Pratt & Whitney 16"x60—Late
New 16, 18, 20", 28" Immediate Del.
New Tool Makers 10x24"
Reid Small Piece #9WSL
Rivett Model 918 Precision, Mod. 715
Sebastian 12"x4' G.H., Sheldon 12"
Sundstrand 8x15", 15" Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14" Production
Brown & Sharpe #3B Plain. Late, 3A, 2I, #2L
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens 1V, 1-8, 1-14, 1M
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2K, 2H Univ., 2H Plain.
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ. Dividing Head

MILLS, VERTICAL

Brand New Vertical Mills
Cincinnati 2 Spindle Hydromatic
Cincinnati #3, #4 hi-power, 08 Vertical
Cleveland No. 1, table 8"x32"
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 2 sp.

PRESSES

Bliss No. 1 Double Action Drawing Press
Bliss 308—SS, Geared, bed 30x30" 255 Ton
Bliss 645, 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 41½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss S-48 Obl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Horning, 15 Ton
Niagara A1½, O.B.I.
Toledo 92½c Double Crank 43x23" bed
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LJ #3

TURRET LATHES

Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7, Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed, Chuck
Gisholt Simplimatic, 18"x16½"
Gisholt 4R—9¼" hole in spindle
Libby 1H5 with threading att.
Jones & Lamson #5, Bar Feed
Morey #2G Late
Oster 601 WD, #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, #4 Preselector (2)

MISCELLANEOUS

Band Saw: DoAll Zephyr 36", 16" Metalmaster
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Boring Bar: Underwood 4"
Broach: 3L LaPointe Hydro. Horiz. New Klink. 6 Ton, Horizontal 11 Ton Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Hand Mill: Whitney
Hoist: 5 ton capacity 7½ HP motor
Honer: Micromatic H-4
Keyseater Davis, Baker
Oil Groover: WICACO
Planer: Niles-Bement-Pond 36x36'x10'
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 12x13"
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt, Cinn. 20, 24"
Shears Power: Obi 10' 3/16", 10"x 16 gauge Vertical Milling Att. New, Bridgefield
Tapper: Haskins—2CA
Welder 50 KVA Eisler Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave

New Lathes 16" to 28". Mills, Boring Mills, Broaches, Shears & Presses

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses 26C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shapers, 7", 8", 14", 18" Shaporite—Shears, Foot 22" to 8', 16 & 18 ga.—Shears Power 3'x18 gauge to 10' x 10 ga.—Welders Arc Seam Spot all sizes Motors, Grinders, Buffers.

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
250 Ton Watson & Stillman 28x28"
300 Ton Watson & Stillman 24x29"
300 Ton Watson Stillman 20"x20" Platen 8" St. 19" opening
800 Ton Williams & White 42"x60"

All Hydraulic Equipment is completely engineered and checked by a competent staff thus assuring reliability.

Send us your Hydraulic problems.

This is but a partial listing. Write for free Catalog. Inquiries Invited. HUNDREDS OF OTHERS

AARON MACHINERY CO., Inc., 45 Crosby Street, New York 12, N. Y.

"CABLE—AARMACH N. Y." **Telephone WOrth 4-8233**

GOOD USED AND NEW MACHINE TOOLS IN STOCK

BULLARD 36" V.T.L. New Era, serial #8979, 15 HP Motor, Chuck Jaws . . . . . $7500.00.

KING 50" Vertical Boring Mill, 2 heads on rail, reconditioned . . . . . $4800.00.

ACME GRIDLEY Model R 4 Spindle 1⅜", serial #33067.4 with 10 boxes collets, tooling, parts, good condition . $5000.00.

ACME GRIDLEY Model F 4 Spindle 1¾", serial #6462. New collets and feed fingers . . . . . $2000.00.

LIBBY Turret Lathe Model A, 18"x3½" hole in spindle, serial #14717, 10 HP 8 spindle speeds, 16" 4-Jaw Universal Chuck. $3000.00.

FAY Automatic 21"x25", serial #8941 $2000.00.

NILES 30" x 30" x 8' Box Table Planer, 10 HP Motor, 1 head. Good condition. $1800.00.

LODGE & SHIPLEY 36" x 12'10" Centers Lathe, serial #14837 with 15 HP Lima Drive . . . . . $3500.00.

HENDEY 16" x 6' Tie Bar Head Lathe T.A. serial #18066, new 4-speed Drive—All Unit, AC Motor, reconditioned . $1600.00.

NEW GERMAN AND BRITISH MACHINE TOOLS

SCHIESS Vertical Turret Lathe, 2 vertical heads, 1 side head, 87" turning dia. Available February, 1953.

SCHIESS Vertical Turret Lathe, 1 vertical head, 1 side head, 65" turning dia. Available December, 1952.

SCHIESS Vertical Turret Lathe, 1 vertical head, 1 side head, 41" turning dia. Available November, 1952.

ALFING High Speed Heavy Duty Drill Press, 25" swing, #3 Morse, 1600 RPM spindle speed, $2600.00. In Stock.

VICTORIA U1 Milling Machine . $4450.00. In Stock.

RICHMOND 4' Radial Drill Press . $3750.00. In Stock.

INVICTA Shapers, 14" . . $2000.00. In Stock.

Swivel Vises 10½" Opening . . . . . $115.00. In Stock.

OTHERS

GENERAL MACHINERY & EQUIPMENT CO.
140-44 S. 17th STREET
HARRISBURG, PA.

AUTOMATIC, #00C B. & S., 1950
AUTOMATIC, 1¼", 4 spin. Gridley Model G
BOLT THREADER, 1½", Williams Reliance
BORING MILL, 100" Cinci, Massive, 2 Hds., M.D.
BORING MILL, 72" King, 2 Hds., P.R.T., M.D.
BORING MILL, 72" N.G.P., 2 Hds., P.R.T., M.D.
BORING MILL, 3½" bar Defiance, Table Type
BORING MILL, 3½" bar Giddings & Lewis #8
BORING MILL, 3" bar Lucas, Table Type
DRILLS, RADIAL, 4', Western, M.D. (2)
6' Amer. 15" col. Trip. Purp., M-on-Arm
5' Amer., 15" col. Trip. Purp., M-on-arm
5' Amer., 14" col., Trip. Purp.
5' Niles #10 Rightline, Univ., Motor-on-arm
4'11" col. Cinci. Bickford
3'9" & 2½' Arbega (Swedish), Late
TABLES, RADIAL, 36"x20"x20"
DRILLS, #8D Calburn 36", 5" capty.
#316 Baker, 24", 3" capty.
24" Cinci. Bick., Tapping, M.D.
#2L MB Leland Gifford, Deep Hole
FLANGERS, ¾" and ½" McCabe (2)
GEAR BURNISHER, Model 8 Fellows
GEAR CUTTER, 60" Brown & Sharpe, #6 Spur
GEAR CUTTER, No. 13 B. & S., Spur & Bevel
GEAR SHAPERS, No. 75 Fellows
Nos. 6, 61A, 64 & 64A Fellows
GRINDER, SURFACE, #16 Blanchard, 30" chuck
GRINDER, SURFACE, 14"x36" P. & W.
GRINDER, 4"x18" Landis #4H, Cylindrical, Late
GRINDER, No. 4T Sellers Tool, 1942
GRINDER, Micro Internal, large capty.
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
KEYSEATER, No. 3½ Baker, 24" str. x 4" wide
LATHES, 48"x20' bed, Amer. T.A., Grd. Hd.
32"x14' bed Schumacher Boyt T.A., M.D.
28'/40"x16' bed Rahn Lurmann, Gap
28'/40"x24' bed Monarch Duo, Spin., M.D.
26"x12' Bridgeford, QCG Grd. Hd., M.D. (2)
24"x12' bed B. & E., T.A., Grd. Hd.
20"x78" Metro, T.A., New
18"x10' bed L. & S., T.A., Cone Motorized
18"x8' bed L. & S. Selective Grd. Hd., M.D.
16", 32"x8' Harrington Gap M.D.
16"x6' & 12"x6' Hendeys (2)
14"x6' bed Amer., T.A., M.-in base
14"x30" cen. Monarch T.A., (6½" sw.
TURRET LATHES, No. 60C Oster 1½", New
No. 3AL Gisholt, 6½" H.S.
No. 3 Gisholt, 1942
No. 2B Foster Univ., 3½" Capty., Bar Timken
No. 1B Foster Univ., 2" capty., M.D.
21" Acme Universal Brass, Late
16" Libby Model A Grd. Hd.
MILLER, No. 30H Sundstrand Rigidmil, 33" feed
MILLER, No. 22L Van Norman, Late
MILLER, No. 5 Reed Prentice, Vert., 1942
MILLER, No. 4 Cinci. Univ., Hi Power, M.D.
MILLER, No. 3 Cinci. Hi Power, Motorized
MILLERS, Nos. 2 & 3 Cinci. Hi Power Univ., M.D.
MILLER, No. 2 Van Norman Ram, M.D.
MILLERS, No. 2 Abene (like Van Norman) New
MILLER, No. 1½ B K. & T. Univ., Grd. Hd.
MILLER, No. 000 B. & S. Plain, M.D., Late
MILLER, No. 0 Sundstrand Rigidmil, Hand
THREAD MILLER, 12"x80" Morey Shields, '42
PIPE THREADER, 2" Landis, Grd. Hd., M.D.
PRESS, 75½ Bliss S.S., 6" stroke
PRESS, 60 ton Henry & Wright Dieing
PRESS, No. 58 Toledo S.S., Grd., 171 ton capty.
PRESS, #3C Bliss 30", "Stiles", Late

BENNETT MACHINERY CO.
375 Allwood Road, Clifton, N. J.
Off Route S-3, Phone Prescott 9-8996
New York Phone: LOngacre 3-1222

BORING MILLS
No. 0 G&L Horizontal Boring, Drilling and Milling Machine
Nos. 31 & 32 LUCAS Horizontal Boring, Drilling and Milling Machines
36" BULLARD Vertical Turret Lathe
100" BETTS Vertical Boring Mill

DRILLS
3'9" CINCINNATI BICKFORD Hi Sed Radial, '41
32" CINCINNATI BICKFORD Upright Drill
No. ES NATCO Multi Spindle Drill—Hyd. table, '42
No. 425 BAKER S.S. Heavy Duty Drill
No. 2MS LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT
Nos. 64, 72 & 725A FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Rougher

GRINDERS
No. 5 B&S 3"x12" Plain Grinder
6"x18" CINCINNATI Plain Hyd. Cyl.—Filmatic
6"x18" LANDIS Type C Plain Grinder
6"x18" NORTON Vertical Spindle Surface Grinder
10"x24" LANDIS Universal Grinder
10"x72" LANDIS Type C Hyd. Pl. Grinder—'42
No. 104 RIVETT Internal-External Grinder
No. 72 HEALD Internal Centerless Grinders
No. 172 HEALD Internal Grinder

LATHES
12"x34" MONARCH Toolmaker's Lathe
14"x6' HENDEY Model ECM M.D. Engine Lathe
16"x30" LODGE & SHIPLEY Toolroom Lathe, '41
20"x10' LODGE & SHIPLEY Selective Geared Head
27"x14' no LEBLOND HD Engine Lathe, '42
30"x16' bed AMERICAN "High Duty" Geared Hd.
36"x10' bed AMERICAN HD Lathe
42"x15' AMERICAN Geared Head Lathe
42"x25' ea AMERICAN "Super Productive" GH Lathe—two carriages

MILLERS
Nos. 0-8 CINCINATI Plain & Vert. Milling Mach.
Nos. 1-S & 1-14 KENT OWENS M.D. Production Millers
Model MM-5 U.S. Multi-Miller
No. 2 B&S Pl. Light Type Miller
No. 2 CINCINNATI Vertical Millers, 1941
18" CINCINNATI Mfg. Knee Type Milling Mach.
4½"x36" P&W Model C Thread Miller
36"x30"x10' INGERSOLL Planer Type, 3 heads
30"x36"x12' INGERSOLL Planer Type, 3 heads, Late

AUTO LATHES & TURRETS
No. 2 B&S Wire Feed Hand Screw Machine
No. 2 W&S Geared Friction Hd. Turret Lathe
No. 3 J&L Ram Type Universal Turret Lathe
No. 1HS LIBBY Heavy Duty Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1942
Nos. 4D & 6B POTTER & JOHNSTON Auto.

WIGGLESWORTH INDUSTRIAL CORP.
203 BENT ST. CAMBRIDGE 41, MASS. KIRKLAND 7-5242

MACHINERY FOR SALE
ATTENTION EXPORTERS

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.

FS-1033, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

NEW LATHES AT BARGAIN PRICES

New 18" x 80" Centers MEUSER LATHE and 24" x 120" Centers MEUSER LATHE. Complete with Taper Attachments, Chucks and all equipment. *GAP BED TYPE.* Available from stock all sizes up to 32" Swing. Will trade for other equipment.

WINSTON MACHINERY CO., INC.
326 W. OHIO ST. INDIANAPOLIS 2, IND.
PLaza 2408

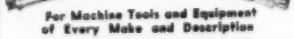
NEW
JUST ARRIVED
In stock N.Y.C.

7' Vertical Boring Mill (Italian)
American Calibrations
Max. Diam. will turn—82½"
Table Diameter—72"
Distance Tools to Table—48"
Speeds Table 16 (1.75-54 R.P.M.)
2 heads on rail (swivel)
1 side head
Motors 35 HP, 8 HP—two 3 HP 3/60/220-240
Weight—66,000 lbs.

6 months guarantee. Photo on request.

KINGS COUNTY MACHINERY EXCHANGE
408 Atlantic Ave., Brooklyn 17, N.Y.
TRiangle 5-5237

Flexible Rubber Hose Assemblies



For Machine Tools and Equipment of Every Make and Description

VARI-PURPOSE HOSE ASSEMBLIES
HYDRAULIC HOSE ASSEMBLIES
PAINT SPRAY & AIR HOSE ASSEMBLIES
LUBRICATION HOSE ASSEMBLIES

For use with the following:

Acids	Gasoline	Paint
Air	Grease	Pneumatic
Acetylene	Grinding Oil	Solvents
Beverages	Hydraulic	Spray
Chemicals	Lacquer	Steam
Cutting Oil	Lubrication	Thinners
Distillates	Oil	Water
Fuel Oil	Oxygen	Welding

Deliveries Immediately from Stock!

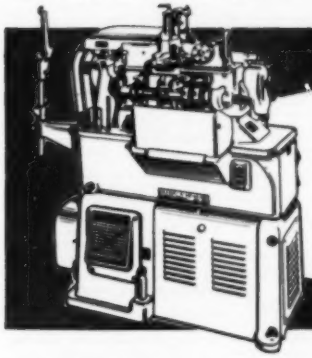
COMPLETE CATALOG AVAILABLE UPON REQUEST

Ask for Cat. #AM3 — 1953

CARLYLE RUBBER CO., INC.
64 PARK PLACE, NEW YORK CITY 7, N. Y.
Phone: Digby 9-3810

10' BETTS
VERTICAL BORING MILL
A.C. MOTOR DRIVE
2 HEADS

CLARENCE J. O'BRIEN
1032 COMMERCIAL TRUST BLDG.
PHILADELPHIA 2, PA.



Beaver-Bilt

BROWN & SHARPE AUTOMATIC SCREW MACHINES

Not Just Rebuilt . . . . But Beaver-Bilt

Beaver-Bilt Brown & Sharpe machines are *unconditionally guaranteed* to produce work to the same tolerances as new machines. Only genuine B & S replacement parts are used and no change is made from standard.

THE FOLLOWING LATE TYPE HIGH SPEED BROWN & SHARPE AUTOMATIC SCREW MACHINES ARE NOW IN STOCK FOR IMMEDIATE DELIVERY

2—No. 00 H.S. Serial Nos. 13256 and 13268 (1938); Swing Stop, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, New Turner Motor Drives. Beaver-Bilt.

2—No. 00 H.S. Serial Nos. 17101 and 17102 (1943); Swing Stop, Screw Slotting Attachment ½" Spindle Cap., 6000 R.P.M. Spindle Speed, New Turner Motor Drives, Beaver-Bilt.

1—No. 00G H.S. Serial No. 14662 (1940); Swing Stop, Screw Slotting Attachment, ½" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in Base, Beaver-Bilt.

1—No. 0 H.S. Serial No. 8529 (1940); Swing Stop, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Drive All Motor Drive. Beaver-Bilt.

2—No. 0G H.S. Serial Nos. 10298 and 11385 (1944); Swing Stop, Vertical Cutoff Slide ¾" Spindle Capacity, 4150 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

6—No. 0G H.S. Serial Nos. 8251 (1940); 10212, 10236, 10914, 10915 and 11009 (1944); Swing Stop, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

2—No. 2 H.S. Serial Nos. 7404 and 7405 (1937); Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed. New Turner Motor Drive. Beaver-Bilt.

2—No. 2G H.S. Serial Nos. 7519 and 7658 (1937); Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

1—No. 2G H.S. Serial No. 7524 (1937); Swing Stop, Vertical Cutoff Slide, Screw Slotting Attachment 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

TRADE-IN SPECIALS IN GOOD OPERATING CONDITION

1—No. 00 Standard Brown & Sharpe Automatic Screw Machine, Serial No. 2658, complete with standard equipment. In very good operation condition.

1—No. 00G Standard Brown & Sharpe Automatic Screw Machine, Serial No. 7641, with High Speed Spindle and Turner Motor Drive, also standard equipment. In very good operating condition.

3—No. 00G H.S. Brown & Sharpe Automatic Screw Machines, Serial Nos. 10310, 11377 and 12123, with Swing Stops, Motors in Base, and standard equipment. These machines are in excellent condition.

1—No. 00G H.S. Brown & Sharpe Auto. Screw Threading Machine, Ser. No. 16024 with Screw Slotting Attach. and Motor in Base. In Excel. Operating Cond.

1—No. 0 Standard Brown & Sharpe Automatic Turret Forming Screw Machine, Serial No. 5698, complete with Motor Drive. Good Condition.

1—No. 0G Brown & Sharpe Automatic Screw Machine, Serial No. 7655, comp. with Motor in Base, and standard equipment. In excellent condition.

1—No. 2 Standard Brown & Sharpe Automatic Turret Forming Screw Machine, Serial No. 541 with High Speed Spindle. Fair condition.

1—No. 2 Standard Brown & Sharpe Automatic Screw Machine, Serial No. 4514 with High Speed Spindle and Standard equipment. Fair condition.

OTHER FINE MACHINE TOOLS IN EXCELLENT CONDITION

1—No. 2 Cam Haskins High Speed Production tapping Machine, Ser. No. T-9721. New in 1944, excellent condition.

4—Lipe - Rollway Pneumatic Bar Feeds, Model 56A, Serials from 255 to 366, Single Bar Type. For No. 00 Brown & Sharpe Auto. Screw Machines. Excellent cond. Price $150.00 each NET.

1—No. 0 High Speed Brown & Sharpe Hand Screw Machine, Serial No. 1725 (1939); with Motor in Base. In excellent operating condition.

BEAVER UNCONDITIONAL GUARANTEE

Any Beaver-Bilt or "as is" machine sold by us can be operated in your own shop for a period of 30 days and, if found unsatisfactory for any reason whatsoever, may be returned freight prepaid for a full refund of the purchase price.

1—Motor Driven Burring Attachment, complete for No. 2G Brown & Sharpe Automatic Screw Machine. In like-new condition. Price . . . . . $500.00 NET

USED AND BEAVER-BILT MACHINERY DIVISION — PHONE: SEeley 3-0680

Beaver Industries

1500 WEST ADAMS STREET, CHICAGO 7, ILLINOIS

Lafayette the GRINDING SPECIALISTS

• BLANCHARD UP TO 84" DIAM. •
• SURFACE UP TO 36" x 120" •

Anything from 84" diam. circle to ⅛" diam.
Anything from ⅛" square to 36" x 120"

CENTERLESS UP TO 20' LONG — INFEED THRUFEED SHOULDER & BAR
CYLINDRICAL EXTERNAL UP TO 16 x 80 — INTERNAL GRINDING
DOUBLE DISC GRINDING — ALL SHAPES — ALL MATERIALS

Steel—Bronze—Plastics—Aluminum—Stainless Steel—Brass, etc.

CLOSEST TOLERANCES — FINE FINISHES — PRICES RIGHT
EXTREME FLATNESS — DELIVERIES ON TIME

LAFAYETTE GRINDING CORPORATION
118 Banker St. Brooklyn 22, N.Y. EVergreen 8-5973

We're Ready NOW for All Types of

PRODUCTION MACHINING
of
STEEL, STAINLESS STEEL,
BRASS, ALUMINUM, etc.

We have open capacity for both multiple spindle automatic screw machine work and Universal Turret Lathe products. Our equipment is all modern and our personnel is of the finest. We are well equipped for all second operations, milling, drilling, etc. and offer a complete service including Heat Treating, Plating & Grinding.

Send Blue Print for Quotation
Ask for Illustrated Folder

STRYKER MACHINE PRODUCTS CO.
186 John Fitch Way Trenton, N. J.

BEVELED GEARS

Manufacturer has some available time for straight cut beveled gear work running from 1½" to 20", depending upon ratio, 4 pitch to 24 pitch. Equipped to handle coniflex or straight bevel teeth if required.

SIER-BATH GEAR & PUMP CO., INC.
9252 HUDSON BOULEVARD
NORTH BERGEN, NEW JERSEY

PATTERNS in WOOD and METAL
for All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us — we will take care of them
GENERAL PATTERN WORKS

NEW SINCE '40

DRILL
4' x 13" Fosdick Radial, Hydraulic

GRINDERS
#2 Norton Universal Tool & Cutter
#5 Brown & Sharpe Plain Cylindrical

MILLS
#2 Cincinnati Hi-Speed Dial Type Vertical
#3 Cincinnati Hi-Speed Dial Type Vertical
#4H Kearney & Trecker Plain Horizontal

TURRET LATHES
#2 Bardons & Oliver Geared Electric
#3 Warner & Swasey Univ., Bar & Chuck

ALEXANDER & FIDEN MACHINERY CO., INC.
1014 Genesee St., Buffalo 11, N. Y.

BENDING ROLL

20' x 3/16" capacity Farnham Bending Roll for rolling light gauge material as used in aircraft and similar industry.

Upper roll 2½", lower roll 3½" dia.

High grade late type machine.

Price attractive.

MILES MACHINERY CO.
2025 E. GENESEE AVE.
SAGINAW, MICHIGAN

Cincinnati #2 Centerless Grinder, Almatic, 1943
Reed model A21 Thread Roller, 1944
Heald #48A single and borematic, 1942
Cincinnati-Bickford Radial Drills 9" Column, 1942

JOHNSON MACHINERY COMPANY
683 Frelinghuysen Ave., Newark 5, N. J.
Bigelow 3-2500

FOR SALE

42" BULLARD CUTMASTER VERTICAL TURRET LATHE

1947 machine, Serial #25200.

Excellent Condition.

FS-5824, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITIES OFFERED

GAGE ENGINEER to sell and service gages. Young, ambitious, with practical experience in the application of gages, preferably in methods. Know-how of gages in Quality Control and in training operators and inspectors in proper use. Leading gage manufacturer has desirable territory. Factory training if accepted. Replies in strict confidence. RW-5834, American Machinist.

SALES MANAGER with knowledge and trade following in Swiss Type Automatics offered New York area. Apply with full information. Replies held confidentially. SW-5678, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITION WANTED

PLANT SUPT.: qualified to assume full responsibility as Plant Manager. Twenty-three years diversified machine shop experience in job shops manufacturing and erecting of heavy precision machinery, familiar with modern machine shop methods, ranging from blueprint stage, through processing, design tooling, estimating & labor relations. Present location Wisc., desires to relocate. Minimum salary $10,000. PW-5771, American Machinist.

SELLING OPPORTUNITY WANTED

SALES ENGINEER for machine tool distributor, M.I.T. graduate, 30, family, desires position in Eastern District. 6 years practical machinist experience. Presently employed as sales engineer. RA-5849, American Machinist.

SEALED PROPOSALS FOR THE PURCHASE OF NEW UNUSED EXCESS MATERIAL BEING OFFERED FOR SALE BY PANAMA CANAL COMPANY will be received by the Superintendent of Storehouses, Panama Canal Company, Balboa, C. Z. until 10:30 A.M. December 5 on Circular #26 part I (Auger, woodboring bits, twist drills, hand tools); December 9 on Circular #26 part II (Expanders, files, punches); December 12 on Circular #26 part III (hand and machine reamers); December 16 on Circular #26 part IV (rules, sledges, tapes, taps, saws, wrenches). Blanks and information relative to these offerings may be obtained from PANAMA CANAL COMPANY, 24 State St., New York 4, N. Y.

STRUCTURAL MACHINERY
12'—½" PLATE BENDING ROLL M/D
10'—⅜" PLATE BENDING ROLL M/D
36"—DOUBLE CRANK PLATE SHEAR
#7 AJAX BULLDOZER
CHICAGO 100 H.P. DUPLEX AIR COMPRESSOR
400 AMP. & 800 AMP. LINCOLN WELDERS
FS-5780, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

WANTED
GISHOLT BALANCING MACHINE
with complete equipment
SIER-BATH GEAR & PUMP CO., INC.
9252 Hudson Blvd. North Bergen, N. J.

WANTED
STAMPING MACHINES
1 or 2 Waterbury Farrel Eyelet Stamping machines #106 or #108 used.
Write fully
Box 46, 1474 B'way, N. Y.

MACHINERY WANTED
Highest prices paid for late type machine tools.
Write — wire — phone
J&L MACHINERY & SUPPLY CO.
7906 Mack, Detroit, Mich

Index of

PRODUCTS ADVERTISED

In This Issue

•

Abrasives, Coated 40-41, 220, 255, 262

Accessories & Attachments (Machine Tool) 74, 228, 266, 278, 285, 286, 300, 302, 310, 312, 316, 328, 338, 370, 372

Arbors & Mandrels 278

Balancing Machines 33, 34-35, 36, 350

Bearings 30-31, 68, 87, 247, 276

Boring, Drilling & Milling Machines (Horizontal) 3rd Cover, 14-15, 104, 312, 336, 368

Boring Machines Internal 2nd Cover

Boring & Turning Machines (Vertical) 14-15, 52A, 52B, 67, 287

Broaching Machines 177, 288

Cams 346

Castings 283, 337, 350

Centering Machines 64-65, 334

Centrifugal Machines 264

Chucks 286, 292, 324, 338, 370, 389, 390

Cleaning & Drying Machines & Supplies 396

Collets 92

Compressors, Air 357

Controls, Electrical 199, 200, 293

Counters 28

Coolant Systems, Filters & Supplies 289, 320, 332, 340

Cut-Off Machines; Sawing Machines 26, 60, 118, 245, 290, 313, 346, 353, 356, 397

Die Casting Machines 80

Die Sets 102, 298

Disintegraters, Metal 296

Dressers 101, 296, 330, 355

Drilling Machines 29, 42, 58-59, 64-65, 88, 93, 108, 116, 219, 239, 273, 314, 319, 322, 326, 334

Drill Jig Bushings 104

Duplicators & Pantographs 24-25, 46, 76, 260, 367, 373

Electro Plating & Polishing Equipment & Supplies 305

Engineering & Production Services 230, 279, 325

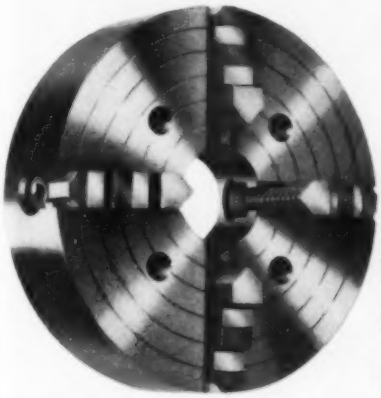
Fabricating Methods & Services 205, 228

Fasteners 18-19, 226, 238, 280-281, 302, 308, 316, 325, 334, 350

(Continued on page 390)

Announcing...
NEW *Buck* 4-JAW CHUCK

DESIGNED ESPECIALLY FOR 9" TO 16" LATHES



FEATURING EXCEPTIONAL

GRIPPING POWER

WITHOUT EXCESS WEIGHT

Most chucks for 9" to 16" lathes are either too light and cheaply made to hold work securely, or too heavy for the lathe and clumsy to handle. Here's the happy solution—a rugged, precision-built chuck with *ideal* weight. New screw design provides *tighter, surer gripping, quicker, easier adjusting.* ½" less overhang improves accuracy, reduces chatter. 6" heavy-duty models—with standard, long taper key, or cam lock adapters. *Send for full details today.*

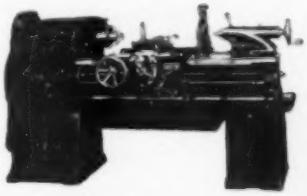
BUCK TOOL COMPANY

1110 SCHIPPERS LANE • KALAMAZOO, MICHIGAN

The BRADFORD *Metalmaster*

...A BETTER LATHE BUY!

12", 14", 16" (Rated Size) Engine & Toolroom Lathes



14½", 16½", 18½", actual swing

BRADFORD Metalmaster Geared Head Lathes have earned an enviable reputation through the years for high efficiency and dependable accuracy. But today's new Metalmaster is even finer. Precision-built of finest materials and components, these lathes are equipped with many outstanding features normally found only on the most expensive lathes.

Where greater power is required the Series "H" Metalmaster is recommended as a 7½ h.p. motor can be used on the 12" and 14" lathe and a 7½ or 10 h.p. on the 16" lathe. Same general design as regular model.

Before you make a lathe investment, investigate the new Metalmaster. Write for Bulletin No. 179.

STANDARD EQUIPMENT FOR METALMASTER LATHES

- 12 Speed Timken Geared Head
- Quick Change Gear Device
- Double Wall Apron
- Tailstock • Compound Rest
- Steady Rest
- Face Plate
- Dog Plate
- Head Center Bushing
- Shear Wipers
- Chasing Dial (Not furnished on Metric Lathes)
- 2 Centers
- Wrenches
- Motor Mounting and Wiring
- Push Button Starter
- Vee Belt Drive
- Automatic Lubrication in Head
- Cabinet Legs
- Lever Control for Length and Cross Feeds
- Mechanical Apron Clutch Control
- L-1 Taper Nose Spindle

A Complete Line of Accessories

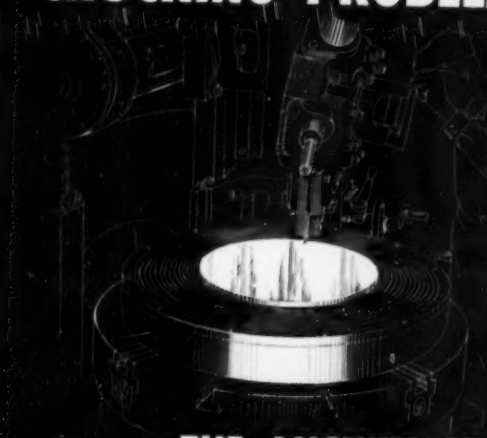
NOTE: *14" Lathe Available For December Delivery on Unrated Orders, Subject to prior sale.*

THE BRADFORD MACHINE TOOL CO.

664 EVANS STREET CINCINNATI, O.

Precision Since 1840

CHUCKING PROBLEMS?

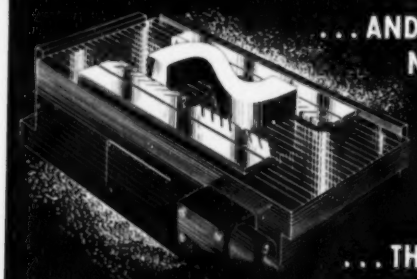


...THE ANSWER IS

Magna-Lock electro-magnetic **CHUCKS**

Get details... WRITE DEPT. AM-112

Rectangular . . . rotary . . . swiveling. Wide range of sizes and voltages. 22% more magnetic area . . . pieces held to extreme edges of chuck. Moisture-proof. Exclusive all-steel construction. Many other advantages.



...AND FOR HOLDING NON-MAGNETIC MATERIALS ON MAGNETIC CHUCKS

...THE ANSWER IS

*patented

Magna-Vise*

Magna-Lock is first to increase your machine's productivity

Hanchett **MAGNA-LOCK CORPORATION**

Magna-Lock Magnetic Chucks and Devices

BIG RAPIDS, MICHIGAN, U. S. A.

Index of PRODUCTS ADVERTISED In This Issue

(Continued from page 389)

Floor Drying Compounds ... 252

Forgings ... 261, 284

Gages & Instruments ... 16, 38, 70, 106, 176, 217, 233, 250, 257, 279, 288A, 295, 296, 314, 316, 326, 369, 394, 395, 398

Gear Cutting Machines ... 3, 6-7, 110-111, 346

Gears, Speed Reducers, Motor Reducers ... 27, 110-111, 264, 266, 342-343, 345, 346, 347

Gear Testers ... 3, 6-7

Grinders—Cutter & Tool ... 12-13, 231, 318, 348, 360

Grinding Machines—Production ... 2nd Cover, 12-13, 52, 69, 70, 262, 291, 318, 334, 358, 360, 374

Grinding Wheels ... 40-41, 90, 220, 255

Heads: Drilling, Grinding & Tapping ... 81, 288B, 292, 334, 364

Heat Treating Equipment & Supplies ... 47, 54, 332

Honing Machines ... 97, 268, 334

Hydraulic & Pneumatic Parts & Equipment ... 53, 64-65, 78, 299, 301, 314, 326, 329

Jig Borers ... 355, 356, 365

Lathes, Automatic ... 17, 22-23, 24-25, 26, 33, 34-35, 36, 55, 57, 61, 64-65

Lathes, Engine ... 38, 46, 49, 76, 79, 86, 253, 277, 285, 338, 349, 352, 364, 367, 370, 389, 393

Lathes, Turret ... 22-23, 33, 34-35, 36, 52A, 52B, 57, 296

Lubricants, Cutting Fluids, Quenching Oils & Solvents ... 43, 72-73, 99, 112, 207, 209, 215, 243

Lubricating Systems & Equipment ... 95, 299

Machines, Super Finishing ... 33, 34-35, 36

Marking Machines, Tools & Supplies ... 98, 314, 334, 354, 368

Materials, Cutting & Forming ... 4th Cover, 91, 94, 251, 256, 274, 328, 330, 372, 392

Materials of Manufacture ... 91, 182, 203, 221, 236, 240, 249, 256, 323, 335, 356, 359

Materials Handling Equipment ... 242, 357

Mechanical Parts & Equipment ... 74, 266, 340

Millers, Die Sinkers, Profilers ... 4-5, 8-9, 20-21, 64-65, 228, 287, 300, 317, 322

Motors, Electrical ... 32, 44-45, 62-63, 82, 213, 318

Index of PRODUCTS ADVERTISED

In This Issue

Nibbling Machines 313

Oil Purifiers 339

Planers 14-15

Power Transmission 211, 362

Power Units 259

Presses, Forging & Forming Equipment & Supplies 50-51, 53, 56, 83, 180, 228, 234-235, 237, 245, 297, 303, 314, 325, 327, 331, 332, 333, 341, 351, 370, 372

Pumps, Circulating 230, 248, 282, 326, 363

Riveting Machines 338

Rust Preventives 221, 294

Safety & Welfare Equipment 338, 366

Saw Blades 60, 226, 298, 372, 391, 397

Screwdriving Machines 328

Screw Machines; Chucking Machines 17, 69, 70, 80, 92, 263

Shafting, Flexible 222, 223, 258

Shapers, Slotters, Keyseaters 118, 329, 364, 370

Shop Furniture 205

Slitting Machines 320

Special Machine Tools 42, 175, 219, 321, 327

Spindles, Machine 75

Stampings 224-225, 374

Steel Blue 370

Tapping Attachments 110, 222-223, 292

Tapping Machines 58-59, 222-223, 273, 319, 321, 334, 372

Thread Cutting Machines 10-11, 318, 372

Tools, Cutting 37, 66, 71, 89, 96, 115, 222-223, 232, 244 246, 254, 260, 265, 288, 296, 302, 304, 311, 315, 318, 322, 326, 340, 344, 361, 368, 370

Tools, Hand 201, 309

Tools, Measuring 398

Tools, Portable 258

Transportation 371

Turret Attachments, Lathe 300

Universal Joints 248

Used & Surplus Equipment 375-388

Vibration Control 229

Vises 286, 390

Welding & Cutting, Brazing & Soldering Equipment & Supplies 227, 241, 267, 274, 306-307, 312

PRODUCTION *Specialists*

An indispensable factor in the uniform high quality of MILFORD Saw Blades is the practical know-how of MILFORD Production Specialists. In every department are trained supervisors—experienced craftsmen who have the added advantage of the accumulated skills and knowledge gained in our over 75 years of one-product specialization. The unmatched capability of these specialists has, to a large degree, made MILFORD Blades truly the . . .

STANDARD OF QUALITY THE WORLD OVER

THE HENRY G. THOMPSON & SON CO.

SAW BLADE SPECIALISTS FOR OVER 75 YEARS

NEW HAVEN 5, CONNECTICUT

PROFILE AND BAND SAW BLADES, HAND AND POWER HACK SAW BLADES

MILFORD

ORDER MILFORD BLADES FROM YOUR INDUSTRIAL DISTRIBUTOR

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

ANNOUNCING...

WHELCO M

OIL HARDENING TOOL STEEL

WL introduces *"Whelco"*—a new tool steel of M grade—a new steel of maximum toughness, hardness and strength—a steel to assure maximum results at low cost! *"Whelco"* offers great penetration of hardness, great toughness at high hardness, wide hardening range, fine grain structure, and desirable non-deforming characteristics. *"Whelco"* has good forging properties and is readily machinable in the annealed condition. All **WL** warehouses stock *"Whelco"* M tool steel in a wide variety of flats and squares. Call your nearest **WL** man for a trial order—the results will speak for themselves!

***WL** steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS

WHEELOCK, LOVEJOY & COMPANY, INC.

Warehouse Service

CAMBRIDGE • CLEVELAND
CHICAGO • HILLSIDE, N.J.
DETROIT • BUFFALO
CINCINNATI

In Canada
SANDERSON-NEWBOULD, LTD., MONTREAL

HY-TEN and AISI

137 Sidney St., Cambridge 39, Mass. and Cleveland • Chicago • Detroit Hillside, N. J. • Buffalo • Cincinnati

INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Abrasive Machine Tool Co.	334
Acme Gear Co.	346
Acromark Co.	334
Adamas Carbide Corp.	344
Adams Co.	346
Affiliated Machine & Tool Co.	338
Air Express Division Railway Express Agency	371
Alemite	95
Allen-Bradley Co.	199, 200
Allied Products Corp.	325
Allison Co.	255
Alvord Polk Tool Co.	296
American Air Filter Co.	320
American Chain & Cable Co., Inc.	313
American Gear & Mfg. Co.	347
American Saw & Mfg. Co.	298
American Sip Corporation	365
American Tool Works	29
American Welding & Manufacturing Co.	267
Ames Co., B. C.	257
Apex Tool & Cutter Co., Inc.	340
Armco Steel Corp.	182
Armstrong-Blum Mfg. Co.	60
Armstrong Bros. Tool Co.	74
Aro Equipment Corporation	299
Arter Grinding Machine Co.	374
Atlantic Gear Works, Inc.	346
Automatic Valve Co.	314
Baird Machine Co.	333
Bardons & Oliver, Inc.	26
Bath Co., Inc., John	254
Bay State Abrasive Products Co.	262
Bay State Tap & Die Co.	265
Beatty Machine & Mfg. Co.	245
Benchmaster Manufacturing Co.	332
Blair Tool & Machine Corp.	346
Blake Co., Edward	348
Blanchard Machine Co.	52
Bodine Corp.	321
Boye & Emmes Machine Tool Co.	253
Bradford Machine Tool Co.	389
Bridgeport Machines, Inc.	300
Brown & Sharpe Mfg. Co.	38
Bryant Chucking Grinder Co.	69, 70
Bryant Machinery & Engineering Co.	39
Buck Tool Co.	389
Buffalo Pipe & Foundry Corp.	350
Bullard Co.	52A, 52B
Bunnell Machine & Tool Co.	327
Butterfield Div. of Union Twist Drill Co.	66
Cadillac Stamp Co.	314
Campbell Div., Andrew C., Amer. Chain & Cable Co., Inc.	313
Carboloy Dept. of Gen. Electric Co.	37
Carborundum Co.	40-41
Card Mfg. Co., S. W.	89
Carlton Machine Tool Co.	108
Carpenter Steel Co.	372
Century Electric Co.	213
Chandler Tool Co.	334
Chase Brass & Copper Co., Inc.	359
Chicago Eye Shield Co.	366

INDEX TO ADVERTISERS

	Page
Chicago Pneumatic Tool Co.	357
Chicago Screw Co.	350
Cincinnati-Bickford Tool Co.	93
Cincinnati Gear Co.	266
Cincinnati Gilbert Machine Tool Co.	3rd Cover
Cincinnati Lathe & Tool Co.	88
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Machine Co. Cincinnati Milling Products Div.	43
Cincinnati Milling Machine Co. Hydroform Division	234-235
Cincinnati Planer Co.	14-15
Cincinnati Shaper Co.	118
Clark Equipment Co. (Industrial Truck Div.)	242
Clearing Machine Corp.	297
Cleveland Automatic Machine Co.	80
Cleveland Crane & Engineering Co.	353
Cleveland Twist Drill Co.	361
Climax Molybdenum Co. of New York	356
Columbia-Geneva Steel Div.	84-85
Columbia Tool Steel Co.	274
Columbus Die Tool & Machine Co.	228
Cone Automatic Machine Co.	17
Consolidated Machine Tool Corp.	67
Cosa Corporation	290-291
Cross Co.	175
Curtis Universal Joint Co.	248
Danly Machine Specialties, Inc.	53, 102
Davis & Thompson Co.	336
Davis Keyseater Co.	364
Dayton Rogers Mfg. Co.	374
Defiance Machine & Tool Co.	368
DeLaval Separator Co.	339
Denison Engineering Co.	341
Desmond-Stephan Mfg. Co.	296
Detroit Die Set Corp.	298
Detroit Power Screwdriver Co.	328
Diversified Metal Products Co.	330
DoAll Co.	269, 270-271, 272
Dodge Mfg. Corp.	362
Dow Chemical Co.	221
Dumore Co.	258
DuPont de Nemours & Co., Inc. E. I. Electrochemicals Dept.	207
Dykem Co.	370
Eagle Picher Sales Co.	252
Eastern Machine Screw Corp.	364
Eastman Kodak Co.	217
Elox Corporation of Michigan	296
Erie Foundry Co.	284
Ex-Cell-O Corporation	104
Fellows Gear Shaper Co.	6-7
Felters Co.	229
Ferracute Machine Co.	372
Firth Sterling, Inc.	71
Foote Gear Works, Brad	347
Foote-Burt Co.	178
Fosdick Machine Tool Co.	42
Fulmer Co., C. Allen	268
Gairing Tool Co.	310
Gallmeyer & Livingston Co.	318
Gay Lee Co.	226
General Electric Apparatus Dept.	32, 44-45
Gerotor May Corp.	363

(Continued on page 394)

SHELDON

CHICAGO U.S.A.

PRECISION LATHES

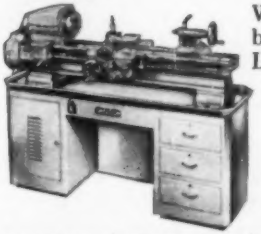
Precision that lasts

. . . "ZERO PRECISION" TIMKEN TAPER ROLLER BEARINGS

SHELDON

"Stamina" Features:

- **Rigid, Heavily cross-strutted 1-piece Beds—2 V-ways, 2 Flat ways**
- **Full Double-Walled Aprons—all gear shafts supported on both ends.**
- **Heavy Carriage with wide bearing on bed.**
- **Twin V-Belts to Spindle for extra power.**



No lathe can be more accurate than its spindle bearings. Hence before buying any lathe one should check the *exact* type and tolerances of bearings used.

The No. TS-56B (and several other) SHELDON Precision Lathes have Timken "Zero Precision" Taper Roller Bearings, held to tolerances of .00015". Not only are these the most accurate bearings used in any lathe, they are the sturdiest type . . . hold their accuracy thru long hard use . . . hold it even under abuse. With the other stamina features built into SHELDON Precision Lathes, they assure continued accuracy, without costly maintenance, thru years of hard service.

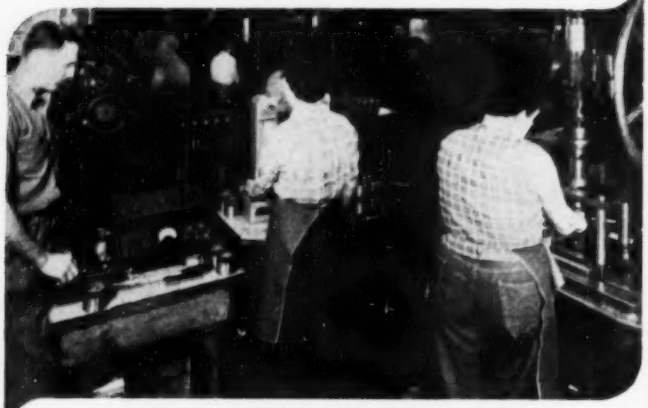
Write for Catalog

SHELDON MACHINE CO., INC.

4234 North Knox Ave., Chicago 41, Illinois

MEASURE IN MICROINCHES RMS

"An Essential Unit of Our Production Line"



says BRADFORD PRODUCTION MACHINE COMPANY about the PROFILOMETER

"In our production of cylinders for hydraulic steering units, we consider the Profilometer an essential piece of equipment . . . and the spot for it is right on our production line," says Bradford Production Machine Company of Detroit.

The above illustration shows the three final operations of the production line. The I.D. of the cylinder is bearingized, gaged for dimensional tolerances, and then surface roughness is checked with the Profilometer. Only seconds away from the machining operations, the Profilometer provides the information necessary to assure constant control of the specified surface finish—which, in this case, is from four to six microinches.

In plants throughout the world—wherever control of surface roughness is a requirement—you will find the Profilometer in use as a fast, simple and accurate shop tool. On the job at the time when surfaces are being produced, it can and does make possible many worthwhile savings in production costs.

To learn how the Profilometer can be used to advantage in your plant, write for these free bulletins.

Profilometer is a registered trade name.

MICROMETRICAL MANUFACTURING COMPANY
formerly PHYSICISTS RESEARCH COMPANY
Instrument Manufacturers
ANN ARBOR 4 MICHIGAN

INDEX TO ADVERTISERS

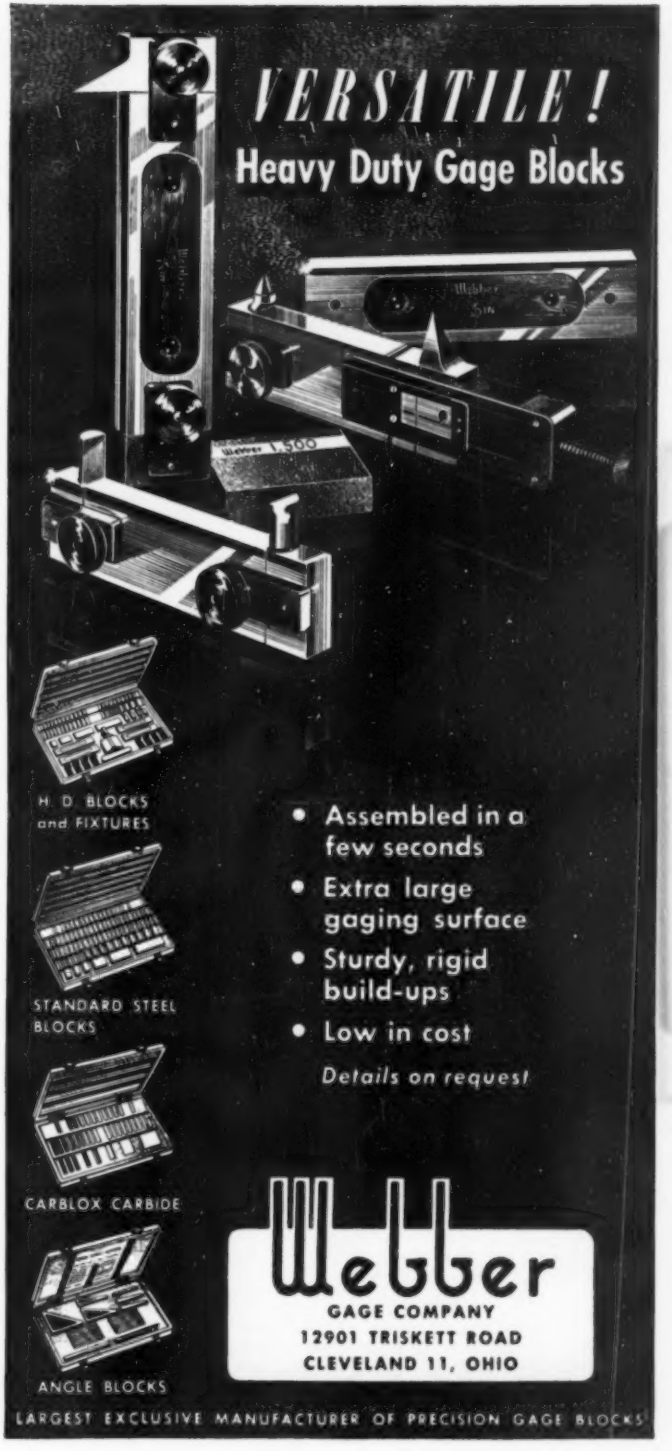
(Continued from page 393)

	Page
Giddings & Lewis Machine Tool Co.	14-15
Gisholt Machine Co.	33, 34-35, 36
Gleason Works	3
Gorham Tool Co.	260
Gorton Machine Co., George	373
Goss & DeLeeuw Machine Co.	263
Grant Mfg. & Machine Co.	338
Graymills Corp.	332
Greenfield Tap & Die Corp.	Insert between 288-289
Greer Stop Nut Co.	226
Grob Brothers	346
Gulf Oil Corp.	209
Hamilton Tool Co.	273
Hanchett Magna Lock Corp.	390
Hannifin Corp.	83, 301
Hanson-Van Winkle-Munning, Inc.	305
Hardinge Brothers, Inc.	79
Haynes Stellite Co.	328
Heald Machine Co.	2nd Cover
H.E.B. Machine Tools, Inc.	46
Hebert Equipment Co.	334
Heimann Mfg. Co.	334
Heller Brothers Co.	309
Hendey Machine Co.	349
Henry & Wright Div. Emhart Mfg. Co.	50-51
Herman Stone Company	295
Hisey Wolf Machine Co.	358
Honan-Crane Corp.	289
Hones, Inc., Charles A.	332
Howell Electric Motors Co.	318
J & L Machinery & Supply Co.	314
J. & S. Tool Co.	101
Jahn Manufacturing Co., B.	237
Jarvis Co., Charles L.	222-223
Johnson Bronze Co.	276
Johnson Mfg. Corp.	397
Jones & Lamson Machine Co.	61, 81
Jones & Laughlin Steel Corp.	91
Kaufman Mfg. Co.	372
Kaukauna Machine Corp.	319
Kearney & Trecker Corp.	20-21
Kelvin Systems Corp.	322
Kennametal, Inc.	232
Kent-Owens Machine Co.	317
Kingsbury Machine Tool Corp.	58-59
Klink, Arthur	288
Knight Machinery Co., W. B.	287
L-W Chuck Co.	338
Laminated Shim Co., Inc. Shim Div.	224-225
Landis Machine Co.	10-11
Landis Tool Co.	12-13
LaPointe Machine Tool Co.	304
Latrobe Electric Steel Co.	251
Lavallee & Ide, Inc.	96
LeBlond Machine Tool Co., R. K.	48-49
Lehmann Machine Co.	352
Leland-Gifford Co.	314
Lincoln Electric Co.	227
Lincoln Park Industries, Inc.	250
Link-Belt Co.	27, 30-31
Linley Brothers Co.	356
Littleford Bros., Inc.	274
Lodge & Shipley Co.	76

INDEX TO ADVERTISERS

	Page
Luers, J. Milton	372
Lyon Metal Products, Inc.	205
M.B.I. Export & Import, Ltd.	367
Madison Mfg. Co.	318
Mallory & Co., Inc., P. R.	241
Manheim Mfg. & Belting Co.	211
Massachusetts Gear & Tool Co.	264
Mattison Machine Works	360
McGill Mfg. Co.	247
Meehanite Metal Corp.	283
Metallizing Engineering Co., Inc.	249
Michigan Tool Co.	110-111
Micromatic Hone Corp.	97
Micrometrical Mfg. Co.	394
Miller Electric Manufacturing Co.	312
Minster Machine Co.	303
Mitts & Merrill	370
Moline Tool Co.	334
Monarch Machine Tool Co.	24-25
Moore Special Tool Co., Inc.	355
Morey Machinery Co., Inc.	296, 312, 322, 364, 368, 370
Morris Machine Tool Co.	116
Mueller Brass Co.	323
National Acme Co.	92
National Automatic Tool Co.	77
Nebel Machine Tool Co.	277
New Britain Gridley Machine Co.	55
Nice Ball Bearing Co.	68
Nicholson File Co.	201
Noble & Westbrook Mfg. Co.	98
Norton Co.	18-19
O.K. Tool Co.	311
Oakite Products, Inc.	396
Ohio Gear Co.	345
Oliver Instrument Co.	231
O'Neil-Irwin Mfg. Co.	260
Orban Co., Inc., Kurt	350
Parker-Kalon Corp.	308
Parker Rust Proof Co.	294
Pawtucket Mfg. Co.	302
Pines Engineering Co., Inc.	331
Pioneer Engineering & Mfg. Co.	230
Pioneer Pump & Mfg. Co.	230
Pittsburgh Gear Co.	347
Pope Machinery Corp.	75
Potter & Johnston Co. Sub. Pratt & Whitney Div. Niles-Bement-Pond Co.	57
Precision Diamond Tool Co.	326
Procunier Safety Chuck Co.	292
Pure Oil Co.	243
Racine Hydraulic & Machinery, Inc.	326
Railway Express, Air Express Div.	371
Randall Co., Inc., Frank E.	296
Ready Tool Co.	328
Reeves Pulley Co.	342-343
Reiff & Nester Company	302
Republic Steel Corp.	335
Revere Copper & Brass, Inc.	203
Riverside Foundry	337
Rivett Lathe & Grinder, Inc.	86
Robertson Mfg. Co.	90
Rockford Machine Tool Co.	329
Ross Operating Valve Co.	78
Ruthman Machinery Co.	248
Ryerson & Sons, Inc., Joseph T.	256

(Continued on page 396)



STOP
THE BIGGEST THIEF
IN AMERICA

1 OAKITE GIVES YOU
THREE WAYS
TO FIGHT RUST

2 3

Day and night—wherever your steel is stored or handled—RUST, the biggest thief in America is robbing you of production, robbing you of profit.

Oakite can help you defeat rust three ways:

☆ **1 By removing rust from raw steel**—often eliminating pickling by removing rust and oil in one operation.

☆ **2 By preventing rust during processing**—protecting your steel all the way from stamping to shipping.

☆ **3 By preventing under-coat rusting of painted products**—combining cleaning, paint-conditioning and rust-prevention in one operation.

FREE For the Oakite Anti-Rust Kit that tells about these three big ways—plus several other methods—to stop RUST in your plant, write to Oakite Products, Inc., 24 Rector St., New York 6, N. Y.

Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE SPECIALIZED INDUSTRIAL CLEANING MATERIALS • METHODS • SERVICE

INDEX TO ADVERTISERS

(Continued from page 395)

	Page
Safe Flight Instrument Corp.	369
S.K.F. Industries, Inc.	87
Scherr Co., Inc., George	314, 372
Schmidt, Inc., George T.	354
Scully-Jones & Co.	278
Serverance Tool Industries, Inc.	370
Sheffield Corp.	106
Sheldon Machine Co.	393
Shell Oil Co.	215
Shore Instrument & Mfg. Co., Inc.	316
Sibley Machine & Foundry Corp.	239
Segourney Tool Co.	326
Simonds Abrasive Co.	220
Simonds Saw & Steel Co.	94
Sinclair Refining Co.	72-73
Smith Corporation, A. O.	306-307
South Bend Lathe Works	285
Springfield Machine Tool Co.	39
Square D Co.	293
Stahl Gear & Machine Co.	346
Standard Pressed Steel Co.	280-281
Starrett Co., L. S., The	176
Sterling Electric Motors, Inc.	82
Steelweld Machry. Div. Cleveland Crane & Engineering Co.	353
Stewart-Warner Corp.	95
Stokvis Edera & Co., Inc.	312, 338
Sundstrand Machine Tool Co.	64-65
Sundstrand Magnetic Products Co.	340
Super Tool Co.	315
Taft Peirce Mfg. Co.	233
Tannewitz Works	356
Teiner Co. Inc., Roland	264
Tennessee Coal & Iron Div.	84-85
Texas Co.	112
Thompson & Son Co., Henry G.	391
Tide Water Associated Oil Co.	99
Timken Roller Bearing Co. Steel & Tube Div.	4th Cover
Tomkins Johnson Co.	115
Tubular Micrometer Co.	398
Turner Bros. Inc.	219
Tuthill Pump Co.	282
Union Carbide & Carbon Corp.	328
U. S. Automatic Box Machinery Co. Inc.	302
U. S. Burke Machine Tool Co.	228
U. S. Steel Co.	84-85, 240
U. S. Steel Export Co.	84-85
United States Steel Supply Co.	84-85, 240
Universal Engineering Corp.	286
Utica Drop Forge & Tool Corp.	261
V & O Press Co. Div. Emhart Mfg. Co.	370
Van Keuren Co.	16
Van Norman Co.	8-9
Veeder-Root, Inc.	28
Verson Allsteel Press Co.	351
Vickers, Inc.	259
Vlier Mfg. Co.	238
Waldes Koh-I-Noor, Inc.	275
Walker Co., Inc., O. S.	324
Waltham Machine Works	318
Warner & Swasey Co.	22-23
Warren Brothers Mfg. Div.	279
Watson-Stillman Co.	180
Webber Gage Co.	395

INDEX TO ADVERTISERS

	Page
Weldon Tool Co.	322
Wendt-Sonis Company	244
Wesson Co. & Affiliates	246
Westinghouse Electric Corp., Electronic & X-Ray Div.	54
Westinghouse Electric Corp.	47, 62-63
West Point Mfg. Co.	316
Wheelock Lovejoy & Co., Inc.	392
Whiton Machine Co.	370
Wickman Manufacturing Co.	100
Willey's Carbide Tool Co.	368
Wilson Co., K. R.	56
Wilson Mechanical Instrument Co.	326
Wittek Manufacturing Co.	266
Yoder Co.	320
Youngstown Sheet & Tube Co.	236

SEARCHLIGHT SECTION
(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT	Page
Selling Opportunities Offered	374, 388
Positions Wanted	388
Selling Opportunity Wanted	388
Employment Agencies	374
Employment Services	388
SPECIAL SERVICES	
Contract Work	388
General Pattern Works	388
Lafayette Grinding Corp.	388
Sier-Bath Gear & Pump Co., Inc.	388
Stryker Machine Products Co.	388
NOTICES	
Proposal	388
EQUIPMENT (Used or Surplus New)	
For Sale	375-388
WANTED	
Equipment	388

ADVERTISERS INDEX

Aaron Machinery Co. 385
Alexander & Fiden Machinery Co., Inc. 388
Beaver Industries 387
Bennett Machinery Co. 386
Botwinik Brothers of Mass. 376
Brownell Machine Tools Inc. 376
Carlyle Rubber Co., Inc. 386
Cowden Machinery Co., W. C. 384
Currier Machine Sales 384
Dony Machinery Co. 382
Eastern Machinery Co. 383
Electric Equipment Co. 380
Fairfield Equipment Co. 380
Falk Machinery Co. 375
Fort Meigs Machinery Co. 384
General Machinery & Equipment Co. 386
Goldman & Co., Harvey 378
Hill-Clarke Machinery Co. 377
Hyman & Sons, Joseph 384
Indianapolis Machinery & Supply Co. 378
J & L Machinery Supply Co. 384
Johnson Machinery Co. 388
Kings County Machinery Exchange 386
Lincoln Machinery Sales Corp. 382
Lucas & Son, J. L. 382
Luria Brothers & Co., Inc. 384
Machine & Tool Co. 380, 382
Machinery Rentals Inc. 381
McDonald Machinery Co. 382
Meyer, Machy. & Equipt. Co., W. H. 382
Miles Machinery Co. 376, 388
Morey Machinery Co. 380
National Machinery Exchange 384
O'Brien, C. J. 386
Osborne & Seaton Machinery Co. 378
Sier-Bath Gear & Pump Co., Inc. 388
Smith Machinery Sales, Ed. 380
Triplex Machine Tool Corp. 379
Vine, Inc., R. A. 382
Wabash Employment Agency 374
Wade-Presdee, Inc. 384
West Penn Machinery Co. 382
Wigglesworth Industrial Corp. 386
Williams, Edward Hale 384
Winston Machinery Co. 384, 386

RE-ORDERS

From Prominent Users of More Than 10 Years Prove the DEPENDABILITY of

JOHNSON METAL CUT-OFF BAND SAWS

They Buy

AGAIN and AGAIN!

There is nothing more convincing of the excellence of a product than constant re-orders. . . . And that is what Johnson enjoys. . . . Users over a period of years prefer to re-order Johnson Band Saws because they're satisfied; they have confidence in Johnson Saws. They know from past experience that they are getting the best value for their money, the best performance. You, too, should investigate this leading line. Learn about Johnson's high machining standards, close tolerances, speed, accuracy and adaptability.

Write for catalog today.

There is a Dealer Near You

Model J, pictured, 10"x18" Capacity, available as a wet or dry cutting machine. Also Junior Model B (with or without casters), 5"x10" Capacity.

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

DIAL FOR ACCURATE

High Speed Inspection

Depth Gage. Readings to 1/1000th.

1" Range Dial Indicator. Adaptable to many tools. Readings to 1/10,000th.

When your production must be held to close tolerances there's a Tumico Dial Indicator gage that will make high speed, accurate inspections. High visibility dials give instant and accurate readings. Our complete and diversified line may provide exactly the right type of dial indicator gage to best speed and insure accurate inspections.

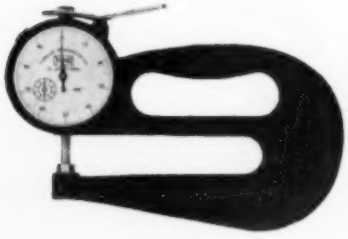
Let our engineers examine your product inspection problem. Write for new catalog showing additional models.

DIAL FOR ACCURATE

High Frequency Checking

1" Range Dial Indicator. Attaches to many tools. Readings to 1/1000th.

Lever Action Hand Thickness Gage with 1" Throat Depth. Readings to 1/1000th.



Lever Action Hand Thickness Gage with 4" Throat Depth. Readings to 1/1000th.

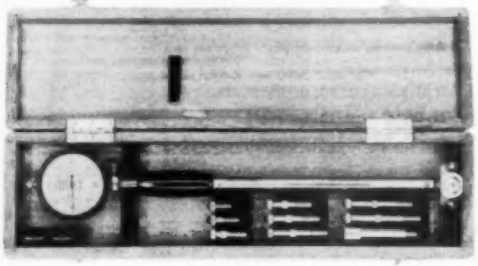
"Quality Control" of production lines can often be improved and speeded up by frequent spot checking with Tumico Dial Indicator hand and bench gages. High visibility assures quick, accurate readings to check vital production points.

Our production engineering department may be able to help you. Write us your problem. Our recommendations and complete catalog showing gages not illustrated will be sent promptly.

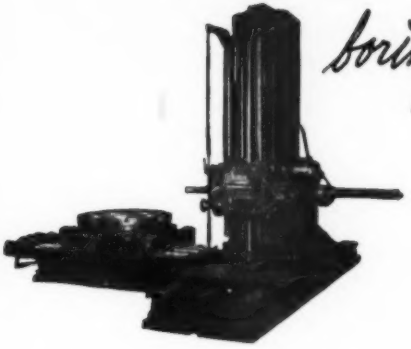
TUMICO DIAL INDICATORS

TUBULAR MICROMETER CO., Box 20, St. James, Minnesota

Dial Bore Depth Gage. Range from 2" to 6" in 10" Bore Depth in 5/10,000ths.



Raise your sights on



boring mill life and accuracy

Cincinnati Gilbert boring mill columns ride on non-metallic way blocks that virtually eliminate scoring, sticking, or wear on the bed ways! The non-metallic material contains thousands of oil-bearing fibers *at right angles to the face of the blocks* which maintain effective lubrication even under the most severe conditions. The records prove it. Gilbert accuracy is also sustained by the use of narrow guides throughout. The head has plenty of heft and a minimum of moving elements in the transmission . . . On your next horizontal boring mill purchase, *aim high on performance:* specify Cincinnati Gilbert, equipped with Gilbert non-metallic way blocks.

THE CINCINNATI
GILBERT
MACHINE TOOL COMPANY
3366 BEEKMAN STREET • CINCINNATI 23, OHIO

those who buy Gilbert buy Gilbert again

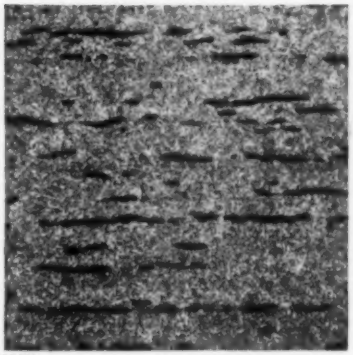
TESTS PROVE GRAPH-MO® BEST STEEL FOR GAGES!

Reports from users show Graph-Mo steel outwears other tool steel 3 to 1!

Graph-Mo® steel is today's big news for gage users and gage makers. The difference between Graph-Mo steel and other gage steels is so real you can see it—in the form of tiny, scattered, parallel marks barely visible on the surface of a polished piece of Graph-Mo. It's the "graphitic look"!

These marks indicate the presence of free graphite in the steel's structure. And this free graphite, together with diamond-hard carbides, enables Graph-Mo to outwear other tool steels an average of 3 to 1 according to reports from dozens of gage users. Tests prove Graph-Mo is also the most stable gage steel ever made. (see below).

Photomicrograph at right shows the free graphite and diamond-hard carbides that give Graph-Mo unusual wear resistance. They minimize scuffing, pick up and galling, and resist abrasion. Graph-Mo machines 30% faster than other tool steels, gives uniform response to heat treatment, and is available *now!*



100X

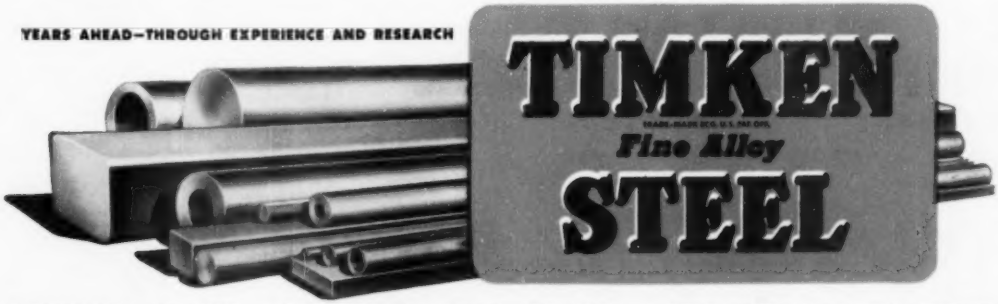
12-year stability test proves Graph-Mo steel master gage stays within 10 millionths of its original dimension

Here's proof of Graph-Mo's outstanding stability. These measurements were taken on a typical Graph-Mo steel master plug gage over a 12-year period. They show only 10 millionths of an inch change after that time.

1940—1.73996 *1941*—1.73995 *1942*—1.73998 *1943*—1.73997
1944—1.73996 *1945*—1.73995 *1948*—1.73997 *1951*—1.73995

You can always tell Graph-Mo by its "graphitic look". This built-in "trade-mark", the result of the free graphite in its structure, can't be duplicated in other steels. Look for it, next time you buy gages. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING